SEP 21 1931

ELECTRICAL WORLD

SEPTEMBER 19, 1931
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EFFECTS IMPORTANT SAVINGS IN PRIME-MOVER LUBRICATION

TYCOL-QUALITY

EFFECTS IMPORTANT SAVINGS IN TURBINE LUBRICATION

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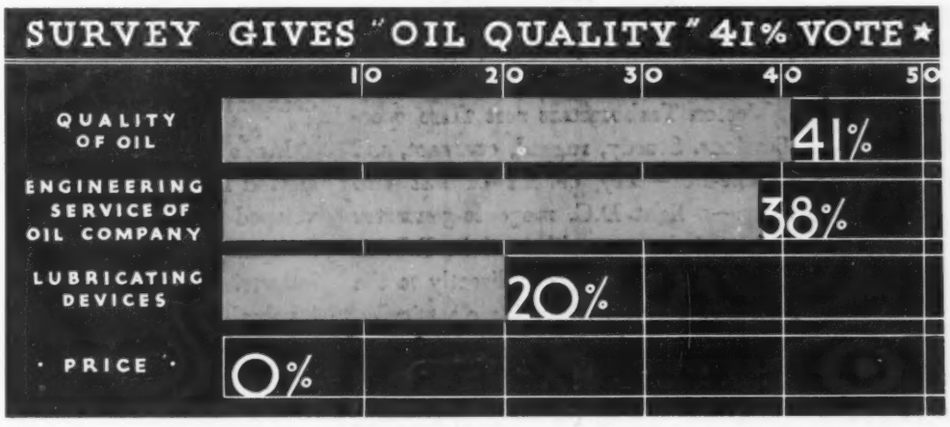

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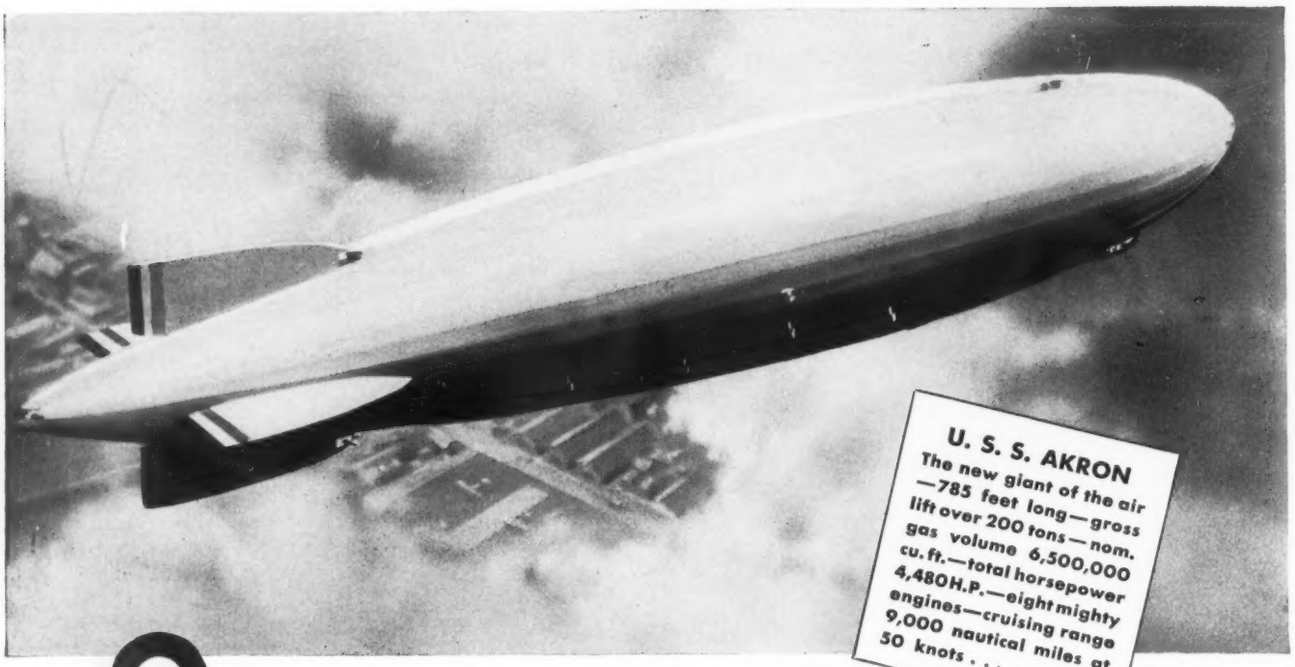

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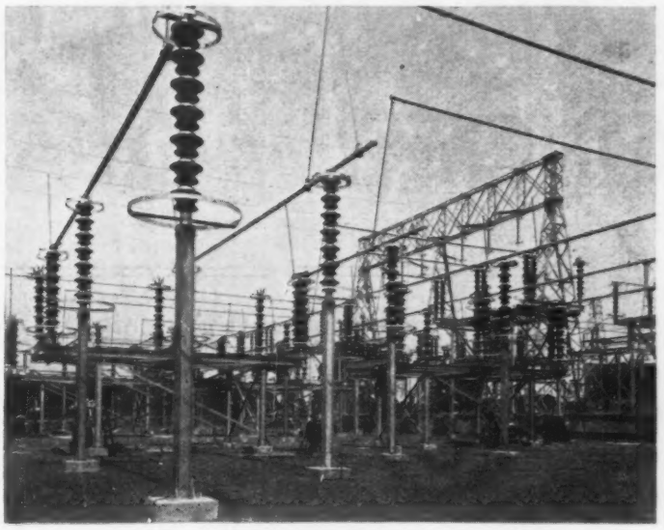

220-kv., 5-in. aluminum bus Roseland switching station, Public Service Electric & Gas Company

SEPTEMBER 19, 1931

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The OVER-ALL ECONOMY *of* QUALITY

WITH increasing cost per unit of system capacity but decreasing revenue per unit of energy sold, much attention is being paid to reducing system investment and operating costs.

These matters raise the question whether savings can be made by changing either standards of materials used in power systems or in the present methods of operation, or both.

Every part of an electric power plant is important and each has its share in controlling continuity of service and cost of operation.

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ELECTRICAL WORLD

for the Week Ending

September 19, 1931

Two depression antidotes proposed

—**Gerard Swope offers a plan** to stabilize the worker in each industry. Suggestion involves life insurance, old-age pensions and unemployment insurance. Trade associations the basis—*pp. 486, 496.*

—**$500,000 gift from Doherty** is offered in response to lament of President Wright of the American Society of Mechanical Engineers that no funds are available for study of depression cures—*p. 488.*

I believe the average citizen is intelligent enough to see the great difference between the low cost of electricity and the high cost of politics.

W. ALTON JONES,
Vice-President
Cities Service Company

Ritchie pleads the utility cause

—**Maryland's chief executive** wants government kept out of all business, states' rights respected and federal regulation minimized. Utilities are forces for the right he tells American Bar Association meeting—*p. 486.*

—**Utility taxes need reforms,** at least in one state, is plea of former tax commissioner, who makes some tangible suggestions for changes and urges utility bodies to unite on a plan for constructive action—*pp. 490, 521.*

—**Reproduction cost basis good,** maintains Maryland Public Service Commisioner who takes violent issue with any efforts to substitute historical cost for the valuation basis so long espoused by utility interests—*p. 509.*

Illumination Congress in London

—**Lighting engineers of world** assemble in England for third international meeting. Progress reviewed as staid old London gapes at flood-lighting wonders and traffic is all but inextricably jammed —*pp. 488, 492.*

—**Modern dairy electrification** proves a lesson in careful motorization. Grouped drives under group control insure full co-ordination of processes. Equipment reliability improved to meet damp atmospheres—*p. 512.*

—**Automobile industry a leader** in co-ordination of good lighting and production. Intensities range from 8 to 140 foot-candles in the Packard plant. Reflection factors make light distribution an important problem—*p. 506.*

Power men hold Southwest conference

Swope Presents Sweeping Plans for the Reorganization of Industry

WHAT is described as "a new constitution for industry, designed to stabilize production and consumption, to minimize unemployment and to solve adequately the problem of security for the worker and his family in illness, disability, involuntary idleness, old age and death," was presented on Wednesday evening of this week by Gerard Swope, president General Electric Company, at the annual dinner of the National Electrical Manufacturers' Association, held in connection with its New York convention. Mr. Swope's address is printed in large part on pages 496-7 of this issue of the ELECTRICAL WORLD. It was discussed at the dinner by Owen D. Young, chairman of the General Electric board; A. W. Robertson, chairman of the Westinghouse board; former Governor J. H. Trumbull of Connecticut, himself an electrical manufacturer, and H. B. Crouse, president Crouse-Hinds Company, Solvay, N. Y.

Mr. Young, while not indorsing the plan unqualifiedly, praised Mr. Swope for his courage and pointed out that the latter had formulated the plan with specific reference to the electrical manufacturing industry and that many of the 600 representatives of the 50 divisions of the industry at the dinner regarded the plan as practicable. He welcomed the plan as the first definitive proposal to stabilize industry and employment and said that if other industries developed similar plans "we should have organized units of the several branches of industry out of which we could build a national industrial council."

The significance of the plan, Mr. Young said, lay in the fact that a responsible industrial manager and the members of a great industry were ready to put before the public an offer of such vast consequence.

Mr. Robertson, after complimenting Mr. Swope on compiling many suggestions in a comprehensive way with definite suggestions as to how they could be co-ordinated, emphasized the imperative need of finding a method by which factories may be operated more regularly. He referred to the fact that plants which in 1928 and 1929 were operating 24 hours a day every day are now operating eight hours a day three or four days a week and said that without regular operation "any plan which attempts to cure unemployment, provide pensions and insurance will be largely a failure. In the face of a universal demand for employment it will be almost a joke. If a man is hungry for a full meal and thinks he is entitled to it, it is useless to offer him a cup of tea. Unless we are able to co-ordinate consumption and production so as to produce steady work, this plan or any other plan will be only partially successful." Control of the factors of supply and demand Mr. Robertson saw as the necessary basis of permanent readjustment.

Former Governor Trumbull said that Mr. Swope's plan was the first concrete and meritorious proposal made by industry to the American people. While the plan was not perfect, he believed that it touched the basic principles of the problem of stabilization.

Mr. Crouse expressed his willingness to put the plan into effect in the electrical industry and asked the board of governors of the N.E.M.A. to make recommendations concerning the idea.

Clarence L. Collens, president of the association, presided at the dinner.

Southwest Conference a Tribute to Modern Power

THREE EDISON PIONEERS, all Kansas City men, addressed the opening session of the Southwest Power Conference at that place on September 7 and were heartily applauded by a large audience of electrical and other engineers representing many associations. The original Edison men were Edwin R. Weeks, 42 years ago president of the N.E.L.A. and the manager of Kansas City's first electric light plant; William Morgan Hand, manager of the local General Electric Company division, and Joseph F. Porter, president Kansas City Power & Light Company. Mr. Porter placed Thomas A. Edison Hall, the auditorium in the company's new skyscraping office building, at the disposal of the visitors, the opening and other sessions of the conference being held there under the general chairmanship of Albert L. Maillard.

J. F. Owens, president of the N.E.L.A., contrasted the conception of power held by men of old—"the worship of the ego within them—the wish to crush, to grind, to destroy that their ego might dominate"—with the modern conception of service to mankind. Mr. Owens discussed the attitude of the critics of public utilities, asking how, if regulation of utilities has failed, government can successfully operate that which it cannot regulate.

Roy V. Wright, president of the A.S.M.E., traced the rapid growth of the use of power in this country and expressed a radical view concerning the relation of scientific progress to unemployment. His speech and a response made to it by Henry L. Doherty are

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SOUTHWEST POWER AND MECHANICAL EXPOSITION AT KANSAS CITY

noted under a separate heading on the next page.

Dean Anson Marston, Ames, Iowa, past-president of the A.S.C.E., urged higher professional ethics and closer study of great national problems.

The Power Conference program included a regional meeting of the A.S.M.E., a joint meeting of state associations of municipal utilities, a convention of the National Association of Power Engineers, and meetings of coal men, safety men and the N.E.L.A. Commercial and Engineering Sections.

A paper read before the A.S.M.E. by S. A. Hadley on "Diesel Engines as Peak-Load Units" brought out a lively discussion participated in by C. E. Beck, B. J. George, P. H. Schweitzer, E. L. McDonald and T. A. Burdick.

H. J. Raymond, Texas, Empire Pipe Line Company, described the automatic, electrically driven, remotely supervised, 75,000-bbl.-per-day oil-pipe-line pumping station 10 miles west of Tulsa at Sand Springs, Okla. The station consists of three 800-hp. synchronous motors driving three three-stage centrifugal pumps, 375-lb. head, operating in series on a 750-lb. head. The remote control is in Tulsa and operates over two No. 10 copper-steel wires 15 miles in length. Another oil-pumping station of this company was described by W. Stueve.

Speaking before the Chamber of Commerce, Marshall E. Sampsell, vice-president N.E.L.A., chiefly discussed utility merchandising and the advisability of co-operation between the utilities and other merchandising organizations. The utility problem had become not the raising of money for investment but the protection of investment, he said.

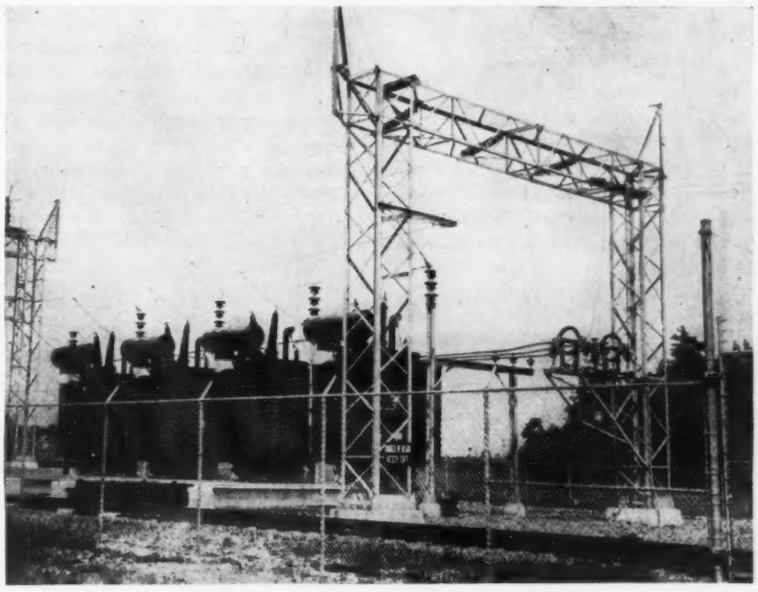
▼

Economy Rules Seattle City Light Department

UNDER A PROGRAM recommended by Superintendent J. D. Ross, the Municipal Light Department's spending program for service extensions and new construction will be curtailed to about $5,671,000 from this time until the end of 1932. Completion of the new Skagit transmission line from the Gorge power plant to Seattle, at a cost of $2,000,000, will be postponed until 1933, and initial development on the Ruby Dam project on the upper part of the Skagit River, destined to cost millions more, is to be held back at least five years.

In accordance with a charter amendment approved by the voters last spring, the City Light Department will soon take over from the engineering department full charge of all construction and engineering work for the municipal light and power system.

MAINE UTILITIES HAVE REMOTE-CONTROL TIE STATION



Near Westbrook the Central Maine Power and the Cumberland County Power & Light systems are interconnected at a new substation containing 20,000 kva. in four transformers to be governed from a substation in Portland, 8 miles distant. A 110-kv. circuit from the Gulf Island hydro station of the first company interchanges energy with the 38-kv. Portland system.

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Ritchie Strongly Against Federal Government Control

POLITICAL and utility circles alike were attentive to the speech made on Tuesday of this week by Governor Albert C. Ritchie of Maryland before the Utilities Section of the American Bar Association, meeting at Atlantic City. In dealing with the regulation of public utilities Mr. Ritchie amplified his well-known adherence to the principle of state rights and in unequivocal fashion ranged himself with those opposed to federal control — let alone government ownership — condemning the "extravagant" utterances of such political leaders as Senator Norris of Nebraska and Governor Pinchot of Pennsylvania. The Maryland Executive scented the possibility that anti-utility agitators sought to raise a smoke screen to obscure the issue of prohibition, which in his own opinion is one pre-eminently demanding attack.

The burden of Governor Ritchie's argument is contained in the following extracts:

If our system of state regulation has not everywhere accomplished all that it is capable of, then it should be built up and strengthened where it is lacking, and through the Anglo-Saxon processes of experiment and trial and error we are daily doing this. Far more is to be expected from strong state commissions, with some degree of that higher interstate concord and co-operation and uniformity which I think I see coming in this and other lines, than will ever be realized for either the consumer or the utility from too much concentration in government, state or federal. That tendency has gone much too far for safety as it is.

I hold no brief for any of the utilities, but I know that the development of power has added immeasurably to the wealth of the nation, and it is not old wealth taken from others by the processes of trade but new wealth wrung from the treasure house of nature. This involves a high order of initiative and enterprise. It calls for risks for which capital has the right to its just return.

Above all, we ought not to regard this utility and power question as a legitimate political issue in any partisan sense. Its ultimate bearing and meaning still lie in the lap of the gods. Power is transforming the world and we cannot yet know the end.

The subject is one for the best brains of the land, regardless of party. No good can come from trying to frame political issues about it or from treating it from any other than an economic standpoint.

Governor Ritchie cited the Ontario Hydro-Electric Power Commission as an example of oppressive political bureaucracy, saying: "Government ownership of the power industry would make us political slaves of the federal government. It would result in a political machine staggering in its magnitude. That is what has happened in Ontario. It would just as surely happen in this country." The light and power industry did not, however, escape criticism at his hands, and he went so far as to term its propaganda antecedent to the Fed-

eral Trade Commission's investigation as "dumb and asinine."

A.B.A. committee report on the regulation of utilities

A special committee reported to the Utilities Section of the American Bar Association the results of a survey made by it of the boundaries between state and federal regulation. It discussed the four following proposed solutions to cover the impingement of these zones on each other:

1. Creation of a series of compacts between various states affected by interstate operations so as to permit such states by means of a joint commission to regulate the interstate commerce involved.
2. Congress to set up regional commissions subordinate to either the Federal Power Commission or the Interstate Commerce Commission, to be made up either of commissioners from the commissions of the several states in such region or of independent federal appointees.
3. Continuance of the present system of leaving unregulated the interstate commerce involved, but have the state commissions deal with problems affecting neighboring states by consultative and joint action with the commissions of such states.
4. Congress to enact legislation specifically divesting electricity and gas transmitted in interstate commerce of its interstate character immediately prior to the sale to the distributing company, thus making its sale subject to regulation in the state of purchase.

This committee's report, which was against direct interference by the federal government with present state and interstate regulatory jurisdiction, was indorsed by Chairman Charles W. Hadley of the Illinois Commerce Commission, Commissioner H. G. Wells of Massachusetts, Commissioner Hugh Drake of Nebraska, legal representatives of the Tennessee and West Virginia commissions, William J. Donovan, Julius H. Cohen and other men well known in the utility field. William L. Ransom presided over the meeting at which it was presented.

Colonel Donovan submitted a proposal that regional state compacts be advocated as the only alternative to federal regulation and possible government ownership, and this plan was favorably received, although no formal stand upon it was taken.

▼

Half Million from Doherty for Depression Research

MUCH NOTICE WAS DRAWN by a speech of Roy V. Wright, president American Society of Mechanical Engineers and managing editor *Railway Age*, before a meeting of the Kansas City Section of the A.S.M.E. and the National Association of Power Engineers last week, which was one of the events of the Southwest Power Conference in the western Missouri metropolis. Dr. Wright spoke to the following effect:

Engineers and scientists have caused the industrial depression and it is up to them to solve it. As a result of their work distribution and consumption have been thrown out of balance with production. It is their business now to apply their science in correcting the situation of unemployment. What is needed is a study by the best experts available to find out what is happening industrially and to discover the remedy. For such a study only $500,000 would be needed, but that is not forthcoming. The American Council of Engineers has recognized the need of this study and has been seeking to obtain a research fund, but so far has been unsuccessful.

Unusual as was the trend of Dr. Wright's remarks, they had a still more unusual sequel, for they brought forth from Henry L. Doherty, president of the Cities Service Company, an immediate conditional offer of the sum designated. Mr. Doherty telegraphed to Dr. Wright:

To encourage you or anybody else attending this meeting to show how these problems can be met, or even if you think you can do it, I have instructed the Chase National Bank to transmit $500,000 to the Commerce Trust Company of Kansas City, Mo., for the needs you represent are necessary and suggest that you lay your problems before the Chamber of Commerce of Kansas City.

Subsequently Mr. Doherty said that he thought all the remedies so far proposed "worthless if not fantastic," but stood ready to give $500,000 "toward any expenditures necessary to correct the present disturbed business conditions, and provided this will accomplish it, and am certain I can raise enough from others to make this easily $5,000,000."

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London Crowds Cheer Light-Adorned City

LONDON HAD ITS first jubilee of light on Tuesday evening, September 1, in honor of the International Illumination Congress. One newspaper headlined its account "Mafficking Crowds in Fairyland," and said it was "the greatest revel since the news of the Armistice sent the city mad with joy." The interest of the populace was so great that the police were taken unaware, control broke down, mounted constables were powerless, bus lines threw schedules to the wind and homebound crowds at midnight jammed every route. The delegates to the congress were aboard boats on the Thames, from which they saw new buildings and old floodlighted for the first time.

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ILLUMINATION OF BUCKINGHAM PALACE DURING INTERNATIONAL CONGRESS

—Wide World Photos

System Development to Occupy New Englanders

COMMERCIAL EXPANSION and system development will be leading themes at the twenty-third annual convention of the New England Division, N.E.L.A., at South Poland, Me., September 28-30, with addresses by President J. F. Owens, Managing Director Paul S. Clapp and Vice-President Harry Reid of the national body and others of note. On Monday morning H. F. Barnes, Cleveland, will speak on "Pointing the Way to Prosperity with Better Lighting"; L. W. W. Morrow, editor ELECTRICAL WORLD, on co-operative merchandising, and Mr. Reid on "New England Leads the Way." The other national officers named will speak at the evening session following President H. E. Duren's address, and there will be a talk on rural electrification problem by F. L. Rimbach of the New England Power Association.

F. G. Harriman, chairman Engineering Section, will open the meeting Tuesday morning, the program including papers on system planning by A. H. Kehoe, chairman Engineering National Section; 4,000-volt primary networks by C. T. Sinclair, Byllesby Engineering & Management Corporation, and rural line construction by W. T. Ackerman, Durham, N. H. Home service work and safety problems will be reviewed at the women's committee session on Wednesday evening under Miss Sue M. Carr, New Central Maine Power Company. Wednesday morning there will be an accounting session, and at a public relations session in the evening, under H. U. Greene, Frank Watts of *Electric Light and Power* will speak.

▼

American Physical Society Honors Faraday and Henry

TRIBUTES TO FARADAY and his American contemporary, Joseph Henry, were paid by the American Physical Society when it assembled at Schenectady on September 10 for its one hundred and seventy-second meeting, held at Union College and in the auditorium of the General Electric Company. A paper on the work of Faraday, written by Sir William Bragg, British scientist, was read by Professor John Zeleny. Henry's work was extolled by Prof. W. G. Magie of Princeton University.

"Faraday was one of the greatest experimental philosophers who ever lived," Sir William Bragg's paper said, "and this judgment is fair whether we consider the skill of his experiments and the brilliance of his arguments, or the influence he has exerted on the thought of the world, or the industrial developments that have been based on his discoveries." Professor Magie pointed out that the work of Henry ran "curiously parallel" to the work of Faraday for several years. Both had a great share in the electrical revolution.

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ST. PAUL'S FLOODLIGHTED

—*Keystone View Co.*

▼

Pontiac Enlarges Borders and Meets Rate Puzzle

PONTIAC, MICH., is the scene of a rate dispute with unusual features. This city of 65,000 people, about 50 miles north of Detroit, is served by the Consumers Power Company and is virtually an isolated property, being surrounded almost exclusively by Detroit Edison Company territory. Lately the city limits were extended, and now there are many Pontiac citizens on Consumers Power lines right across the street from Detroit Edison customers. The rates of the latter utility as compared with those of the Consumers Power are lower for residential and higher for commercial customers.

In response to a demand by Harry Mitchell, City Commissioner of Pontiac, that the domestic rates of the Consumers Power (serving the thickly populated district) be reduced to correspond with those of the Detroit Edison in the outlying territory, the first-named utility expressed its willingness to adopt the whole Detroit Edison tariff, but not to lower domestic rates without increasing commercial rates to equal the Edison's. The plan suggested would, of course, be satisfactory to residential consumers, but not to those who would have to pay the increased commercial tariff. The Michigan Public Utilities Commission may take a hand in the situation, which has brought about agitation for municipal ownership.

Pennsylvanians Deplore Governmental Meddling

CRITICISM OF THE growing tendency of the government to interfere with private business was intermingled with the expression of a militant but constructive attitude toward critics of the electrical industry at the Bedford Springs meeting of the Pennsylvania Electric Association, September 9, 10 and 11.

President J. F. Owens of the national body asserted that the government had gone far afield from its original purpose. Extravagance was rampant, waste astounding and taxes staggering. Bureau after bureau had been created to take over tasks and duties which "belong of right to us as individuals." He called upon business men to consider this growing tendency and meet it with an aggressive assertion of individualism. Both Mr. Owens and Managing Director Clapp of the N.E.L.A. called upon men in the industry to study the business in all its forms so that public understanding of its policies and purposes may be had.

A policy of building local public relations through education of employees was announced by D. C. Green, chairman of the Public Relations National Section. Pamphlets and plans are being prepared to this end.

An outstanding address was made by John Spargo on social aspects of the light and power industry. He said that no other record could be found of so large and successful a growth. Moreover, no parallel existed for its contribution to social wellbeing or for its cleanliness in leadership.

Mr. Spargo urged that a positive obligation rested upon the industry not only to defend itself but aggressively to attack those who challenge its policies from political or selfish motives. This duty lies on the millions of stockholders as well as the employees and has a direct bearing on the maintenance of individualism as a principle. Mr. Spargo cited Governor Pinchot as a critic who by "his numerous utterances upon the subject manifests a capacity for misreading and misunderstanding the data of social evolution so colossal as to be almost incredible. It approaches genius in its vastness and gives him easy preeminence as a prophet of confusion."

A topic of special interest, the merchandising of appliances, brought forth urgent pleas for co-operation and the adoption of better business practices through the application of the principles of the Joint Merchandising Committee. Speakers were J. E. Davidson, R. J. Atkinson, J. E. North and T. R. Dobson.

An excellent program was held under the auspices of the women's committee, with D. C. Green, Gertrude Kline, Ada Bessie Swann and Alice Marshall Adams as speakers. In the accounting

meeting motion pictures added to the value of a good program by showing modern methods for handling billing and customer records. J. H. Lobban cited the effectiveness of wage incentive systems in accounting department work, and L. W. W. Morrow cited "cost-of-doing-business" data among dealers to show the need of better accounting in merchandising practice. In the engineering meeting General R. I. Rees, Philip Cabot and A. H. Kehoe spoke on current problems of the industry and stressed the personnel and policy aspects of engineering as being of paramount importance to progress.

An attendance of about 600 was recorded, and social entertainment features were well planned and greatly enjoyed. W. H. Wade, vice-president of the Penn Central Light & Power Company, was elected president for the ensuing year.

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Martin Insull Reiterates Views on "Power Issue"

THE "POWER ISSUE" was described as a subterfuge veiling more serious attacks on American industry in an address delivered by Martin J. Insull of Chicago, president Middle West Utilities Company, before the Twin City Bond Club at St. Paul last week.

Mr. Insull traced the connection of many of the power industry's critics with organizations whose purpose is the abolition of private ownership and initiative in industry These activities, he declared, are a threat to the further progress of American business.

"The term 'power trust' is used by these critics despite the fact that the Federal Trade Commission's investigation showed that there is no power trust," Mr. Insull said. "Naturally there can be no 'trust' in an industry whose prices are subject to public regulation. There have been consolidations, of course. It is these consolidations that have caused constantly improving service at continuously reduced rates in thousands of communities. We could not have had in this country today the outstanding power service of the world without consolidations and mergers. The fundamental economics of power, generation and distribution are such that mergers and consolidations, or at least interconnections of contiguous systems, are to the best interest of the public as a whole, both as to service and as to rates."

Mr. Insull said further: "The future of the electrical industry is unlimited, since the use of energy in the home, already double that of 1920, grows more rapidly each year and before long will have reached a figure many times as great as the present average annual household consumption of 560 kw.-hr.

ELECTRICITY HELPS BUILD LOUISIANA LEVEES

—Courtesy The Exciter

Driven by a 600-kva. synchronous motor energized from the lines of the Louisiana Power & Light Company, this tower excavator machine, 137 ft. high, moves 10 to 15 cu.yd. of dirt a minute near Tallulah, La.

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Not many years from now the average American home will be measuring its use of electrical energy in thousands of kilowatt-hours. Refrigeration, cooling rooms, ventilation, heating, cooking and operating the scores of different pieces of machinery that a house needs today—all these uses have come in a comparatively few years. Why, we have only scratched the surface in our utilization of electricity in the home."

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Agitation in Arkansas to Tax Electricity

PLANS FOR INITIATING acts levying taxes on electrical energy produced and sold in the State of Arkansas were launched at a recent meeting of citizens at Little Rock. Under a proposed measure all public utilities in the state would be assessed a certain percentage of the gross sales in each month, the proceeds to be used in retiring indebtedeness of school districts and to aid school building programs. A committee appointed to further the plan said that a state-wide meeting will be called in the near future to initiate the measure.

The proposed utility tax bill is similar in its general purpose to a bill which met defeat in the last session of the Legislature. That bill provided for a graded tax on energy consumed, figured at 2 per cent for the average domestic or commercial customer.

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Utility Tax Reform Urged by New York Official

DELEGATES TO THE twenty-sixth annual convention of the Empire State Gas and Electric Association at Lake George, N. Y., on Thursday and Friday of last week heard Mark Graves, formerly State Tax Commissioner and now Director of the Budget for New York State, urge a reform in the taxation of utility companies. "I have been thus far disappointed," said Mr. Graves, abstracts from whose speech are printed on page 521 of this issue, "that the public utilities have not come forward and presented any constructive suggestions of moment. If they do not do so, they are simply missing an opportunity."

Other speakers included President William J. Welsh, Arthur L. Mann, chief of the industrial service bureau, State Department of Education, who urged employee "education for co-operation"; Carl D. Jackson, who outlined the ways in which the federal government now encroaches upon state rights and pointed to possible developments under which more rights and privileges might soon be lost forever by the commonwealths, and Maurice C. Burritt, Public Service Commissioner, who called upon the utilities to serve the farmer as a social duty at low rates.

Mr. Burritt urged that the distribution of electrical energy be viewed as an "area" rather than a "line" problem, so that costs and rates might be placed on that basis and stipulations of minimum acceptable line-extension revenues be avoided. He also advocated financial aid for the purchase of wiring and equipment by the farmer through loans at local banks. It was Mr. Burritt's contention that rates should be established upon a community basis without penalty for the rural uses, since "no segregation of costs is possible and experts continually differ over them."

Another speaker at the meeting was Harry Reid, vice-president National Electric Light Association and president National Electric Power Company. His topic, "The East Comes Back," envisioned a new industrial life for the Eastern seaboard states.

Other addresses dealt with topics of interest to gas utility men. About 125 members and guests were registered.

Scattered Happenings in the Electrical Sphere

UNITED STATES

Maryland Utilities Men Meet

Braddock Heights was the scene on September 11 of the midyear meeting of the Maryland Utilities Association. At the session of the electric group the program included papers on the limitations of single-phase motors for farm use by Ray W. Carpenter of the University of Maryland, on increasing home use of electricity by Austin Monty of the Philadelphia Electric Company, on lighting in the home by J. C. Fisher of the Consolidated Gas, Electric Light & Power Company of Baltimore, and on the "Inpressions of a Newcomer" by P. L. Holland, chief engineer Maryland Public Service Commission.

American Welding Society Program

Meeting at Boston on September 21-25, a full program, with four morning and three afternoon sessions, awaits the American Welding Society. Among the papers presented will be: "Yale University Group of Welded Buildings," by G. D. Fish; "Future of Welded Ship Construction," by J. Kjekstad; "The Engineer, the Welder and the Foundryman," by P. J. Horgan, General Electric Company; "Fatigue Properties of Welds," by R. A. Weinman, General Electric; "Relief of Welding Strains by Annealing," by C. H. Jennings, Westinghouse, and "Factors Affecting the Weldability of Steel," by Wilmer E. Stine, Lincoln Electric, with a prepared discussion by F. T. Llewellyn, United States Steel Corporation.

Pushing Safe Harbor-Baltimore Line

Construction of the 70-mile, 220-kv. transmission line which the Pennsylvania Water & Power Company is building between the new Safe Harbor hydro development and Baltimore is nearing completion. Built on a 150-ft. right-of-way, it calls for 350 steel towers, of which 290 have been erected. Concrete footings for the towers are 97 per cent complete, and wire and insulators are already in place on 22 per cent of the line. On the 17½ miles of line in Pennsylvania, cable has been strung on all of the towers. This work is progressing at the rate of a mile a day. The towers have an average height of 70 ft. from their bases to their crossarms and are set for spans of 1,000 ft.

Crisp County Power for Macon, Ga.?

Announcement has been made by Albert Adams and associates of Macon, Ga., that they have purchased an option for the distribution of electrical energy in that city from the Crisp County hydro plant near Cordele, over whose operation there has been contention before the state commission and in the courts because of the endeavor of the Georgia Power Company to meet the competition of the county-owned plant. Mr. Adams is quoted as saying that the rate obtained from Crisp County is about one-half the Georgia Power Company's rate in Macon. The Mayor of Macon asserted that he had nothing to say in the absence of any definite offer, and E. S. Killebrew, chief engineer for the Crisp County plant, said he did not know the plans of the Macon group.

New York Rate Cases Adjourned

Hearing of the petition of the Washington Heights Taxpayers' Association for a readjustment of the new rates of the Edison companies in New York was adjourned last week until September 18, the association not being ready with its case. In the meantime Corporation Counsel Hilly continued his letter-writing activity in the interest of the association named and other complainants and himself submitted suggestions for changes in the rate structure.

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Coming Meetings

International Association of Electrical Inspectors — Southern Section, Dallas, Sept. 21-23. R. L. Gatewood, P. O. Box 1743, Atlanta. Southwestern Section, Sacramento, Calif., Sept. 28-30. C. W. Mitchell, 914 Merchants' Exchange Bldg., San Francisco. Northwestern Section, Salem, Ore., Oct. 5-7. F. D. Weber, 414 Lumbermen's Bldg., Portland, Ore.

American Welding Society — Copley-Plaza Hotel, Boston, Sept. 21-25. M. M. Kelly, 33 W. 39th St., New York.

New England Division, N.E.L.A.— Poland Springs House, South Poland, Me., Sept. 28-30. Miss O. A. Bursiel, 20 Providence St., Boston.

American Association of Engineers— Huntington, W. Va., Sept. 28-30. M. E. McIver, Willoughby Tower, Chicago.

American Electric Railway Association —Atlantic City, Sept. 28-Oct. 2. Guy C. Hecker, 292 Madison Ave., New York.

Great Lakes Division, N.E.L.A.— French Lick Springs Hotel, French Lick, Ind., Oct. 1-3. T. C. Polk, 20 N. Wacker Drive, Chicago.

Association of Electragists International—Hot Springs, Ark., Oct. 5-8. L. W. Davis, 420 Lexington Ave., New York.

National Safety Congress—Chicago, Oct. 12-16. W. H. Cameron, 20 N. Wacker Drive, Chicago.

Illuminating Engineering Society—William Penn Hotel, Pittsburgh, Oct. 13-16. E. H. Hobbie, 29 W. 39th St., New York.

National Association of Railroad and Utilities Commissioners — Jefferson Hotel, Richmond, Va., Oct. 20-23. J. B. Walker, 270 Madison Ave., New York.

Wisconsin Utilities Association—Commercial Section, Oct. 22-23, Hotel Loraine, Madison; Electric Section, Hotel Pfisterer, Milwaukee, Nov. 12-13. J. N. Cadby, 135 W. Wells St., Milwaukee.

American Institute of Electrical Engineers—District meeting, Kansas City, Mo., Oct. 22-24. F. L. Hutchinson, 33 W. 39th St., New York.

National Electrical Wholesalers' Association—Starrett's Netherland Plaza, Cincinnati, Nov. 9-13. E. Donald Tolles, 165 Broadway, New York.

North Central Electric Association— Accounting Section, St. Paul Hotel, St. Paul, Nov. 13 and 14. J. W. Lapham, 803 Plymouth Bldg., Minneapolis.

South Carolina Utilities Will Fight On

The three companies contesting South Carolina's half-mill kilowatt-hour tax on energy, whose contentions, as told on page 442 last week, have been overruled by a statutory United States court in North Carolina, are reported to intend taking the case to the United States Supreme Court in a further endeavor to have the law annulled. The Duke Power Company, which is suing to recover installments of the new tax already paid, will not join this movement.

Jurisdiction on Holston River Argued

Argument before the Virginia Corporation Commission last week over the project of the Holston River Power Company turned on the question of jurisdiction. The 210-ft. dam is to be built in Tennessee, below Bristol, but it would cause seven miles of land in Virginia to be flooded along the riverside. The commission reserved its decision. The Edmondson Electric Company owns part of the proposed pond area and expected to develop it.

Kansas Utilities to Report Affiliations

An order just issued by the Kansas Public Service Commission directs all public utilities operating in Kansas to file reports showing all their financial and contractual relations with holding and affiliated companies. The reports must be filed by October 1. The order, which is a sweeping one, is intended to prevent any public utility in the state making payments to holding companies until the commission has investigated the "reasonableness" of the charges.

No Rehearing Asked on Cheat River Case

With the expiration of the thirty days allowed the West Virginia Power & Transmissior. Company to file a petition for rehearing of the case decided by the State Supreme Court against the constitutionality of the water-power law of the commonwealth (ELECTRICAL WORLD, August 22, page 310), the decree has become final.

CANADA

Beauharnois Construction Passes Peak

Active construction work on the Beauharnois power development on the St. Lawrence, in Quebec, which was begun just two years ago, reached its peak recently, and from now on building activities will gradually dwindle. Actual operations at the site have been overshadowed by unfavorable corporate disclosures. At the present time there are 3,400 men employed compared with 3,900 a couple of weeks ago. One of the main features of the development, the power house, has been nearly completed, and it is expected that installation of the first two 50,000-hp. generators will be commenced in a month's time. Most of the equipment for these two units will be in place at the end of the year.

©Keystone

London lights up for illumination congress

Tower Bridge, London, was just one of the many structures which were especially illuminated during the recent international illumination congress and for the Faraday centennial celebration next week. As in most celebrations, considerable special lighting is provided for the occasion, but some of it is retained permanently after the effects are observed and the advertising value recognized

EDITORIALS

L.W.W.MORROW
Editor

Swope proposes a stabilization plan

IT IS to the credit of the electrical industry that Gerard Swope has proposed the first tangible business plan for organized industry first to ameliorate and then to eliminate unemployment. In his notable address before the National Electrical Manufacturers' Association on September 16 Mr. Swope suggested the trade association as the industry mechanism for carrying out far-reaching changes in industry conditions. He puts the problem up to the industry, suggests its solution and introduces government only in a supervisory capacity.

The Swope plan will be conceived by some as the socialization of industry; others will consider it ideal but impracticable; still others will find fault with details; but all interested in national conditions will find it profitable and valuable to study the plan carefully and closely before passing judgment on its merits and demerits. It is placed before the nation as a contribution by one of the ablest business men and one of the most experienced employers in the country.

In brief Mr. Swope proposes that laws be changed so that organized industry may group itself into trade associations. These associations shall have power to standardize cost accounting, balance-sheet statements and trade practices and shall be permitted to disseminate market and production information. All units shall be required to join the association and conform to its rules, and government would appear only in a regulatory or supervisory capacity. Under the auspices of these trade associations employees would be protected by workmen's compensation acts, life and disability insurance, old-age pensions and insurance against unemployment. The costs would be borne by employer and employee, and the funds would be administered by a board of administration consisting of representatives of the employees and the employers. Each trade association would have a general board of administration of nine men—three appointed by the employers, three by the employees and three by the federal supervisory body—and this board would have general control of insurance, pension and unemployment insurance plans.

These radical steps would tend to put all domestic corporations on a parity for domestic business, providing for standard forms of financial reports, obligating them to co-ordinate production and consumption and stabilizing employment. The plan is premised upon business organizing in a practical way to weld independent units together so they may act. It recognizes changed social and industrial conditions and intimates that if business does not do these things the politicians will bring forth their own plans to accomplish the same purposes. It is to be hoped that the plan will receive thorough and unbiased study and, if found worthy, will be adopted. It subdues individualism in business only as regards unemployment and the elimination of guesswork in production and costs. Positive and radical in its effects, it is a constructive attempt to meet present conditions.

When the wages of economy is waste

WORD comes from various parts of the country of much misguided effort to save money in the cost of maintenance on power lines and service equipment. The order has gone out to cut expenses, and this is wise if it be done with judgment. But there is always the danger that it will set up a competition for false "savings" that will finally result in unjustifiable waste.

This apparently is happening in some systems where the economy order has not been adequately interpreted and intelligently guided. Manufac-

turers report that there is considerable buying of repair parts for obsolete equipment that in the end will cost more to rebuild than to replace. This is not saving money, it is extravagance. And such measures are certainly not needed or justified in the electrical industry, where income and earnings have continued so close to normal in comparison with almost every other line of business. Extravagant efforts to save a few dollars for 1931 will cause a disproportionate expense a few years later. The wages of this mistaken zeal is waste.

Spargo states social obligations

IN A BRILLIANT address before the Pennsylvania Electric Association last week John Spargo analyzed the light and power industry from the standpoint of its social influences and civic obligations. This converted socialist and well-known writer and economist stated the basic reasoning for industry social policies. In his opinion electricity has made material and social contributions unsurpassed in history, and light and power executives have shown less inefficiency and greater realization of values and social obligations than any other industrial group.

Now that the electrical industry has thousands of employees, millions of stockholders and is so necessary in national life, it has become, Mr. Spargo said, the duty of its leaders to be aggressive in stating its record and its policies to the public. He contended that it is time that the public be made to understand that the leaders of the industry are quite as interested in serving their patrons as they are in making dividends. He declared that this industry now witnesses the greatest application of business conciliation, the finest co-operation of labor and capital and the best conduct of business with a sense of social obligation and responsibility that can be found.

When it is attacked by self-seeking politicians as a heartless monopoly whose only thought is to rob its patrons, he insisted that the industry owed a duty to the nation as well as to itself to refute the libels and assert the truth. He urged that attack rather than defense was necessary and cited Governor Pinchot as one of the typical critics whose "capacity for misreading and misunderstanding the data of social evolution is so colossal as to be almost incredible."

Thus again a warning is sounded against the creeping paralysis being placed upon private business by demagogues, and again the declaration goes out "that the greatest menace to the well-ordered progress of our people lies in the tendency to stifle private enterprise and the great incentives to individualism and to substitute for them state enterprise with its inevitable political motivation and standards." This is the inevitable goal of those who selfishly carp at the industry, no matter what disguise they wear.

The light and power industry, with its record, with its consciousness of rectitude, with its size and with its national importance, should not be and must not be the stepping stone to state socialism. It is the largest yet cleanest business the world knows or has known, and it can and should be the one best able to maintain the principles of American individualism. This is both a selfish and a national duty.

New electrical standards committee becomes international in scope

ANOTHER step forward in the identification of national (United States) with international standards has been accomplished by the acceptance of the newly organized electrical standards committee of the American Standards Association as the United States National Committee of the International Electrotechnical Commission. The idea of the new committee was initiated by the American Institute of Electrical Engineers early in 1930, and eighteen months later is is received and approved by all parties in interest. As such matters go this is fast work, and those responsible for its forwarding are deserving of congratulation on their performance.

It is to be recognized that the difficulties attendant upon any standardization effort lie not alone in the normal tendencies of men to go different ways when they lack co-ordinated direction. There are also the deliberate intentions of certain manufacturers who look through the spectacles of short-sighted selfishness and believe that their refusals to recognize proposed standards and their deviations from accepted ones will protect their markets. Happily for human progress in the material sense, this attitude is of much more seldom occurrence now than it was not so many

years ago, and perhaps the instance of community of interest furnished by the present formation and future functioning of the electrical standards committee indicates that such a feeling will be wholly non-existent tomorrow.

Aside from its significance as a working unit for the promotion of standardization in the domestic electrical field, the new committee represents a very worth-while contribution to the coordination of international and national standardization effort. The idea of a single group working in its own national field and being also the representative of international interest is an excellent one. It promises the avoidance of duplicated work, and it has the great virtue of retaining the same minds for dealing with both the domestic and the foreign aspects of a single problem.

Extend the usefulness of fixed-capital records

FIXED capital is so frequently brought into discussions and decisions that it is very important that records pertaining to it be maintained in such a way that the information desired may be speedily and accurately available. A detailed accounting record of costs arranged in chronological order without being subdivided into logical units, or a record by reference to detail without descriptive information, canot be classified as a fixed-capital record system.

Properly kept, fixed-capital records should give details of book value retired from service, figures necessary to make annual reports more understandable, and even information for estimating future construction. When necessary to secure commission sanction of security issues or rate adjustments, it would only be necessary for an appraiser to spot-check the records to prove the actual existence of the property. Checking of tax assessments and insurable values would also be facilitated. Proper records should also give the age of property retired and indicate whether retirement reserves are being set aside as fast as is desirable.

In view of these and other advantages, serial report No. 152 of the fixed-capital committee of the N.E.L.A. should be of interest to the individual companies, showing as it does the routine and forms for establishing the detailed fixed-capital records kept by the Philadelphia Electric Company and the Detroit Edison Company—two organizations which have gone into this problem quite exhaustively.

West Coast utilities feel the pinch

MANY questions are being asked as to why utilities, whose earnings are protected and whose gross revenue is off not more than 1 or 2 per cent at the most, should be resorting to drastic economy measures. At least as far as power companies on the Pacific Coast are concerned, the answer is quite obvious when once one gets the picture of what has happened in that region.

For a long period of years these utilities have enjoyed a steady and consistent rate of growth of from 10 to 20 per cent a year. This has called for large and sustained capital expenditures year after year, and organizations have been geared up to engineer and superintend these construction programs. During this period a large proportion of engineering and superintendence has gone into construction and has been capitalized, as it properly should be.

What happens when the rate of increase in load falls off to nothing, as it has in almost every case? Construction ceases, and overhead expenses previously going into capital account must now go into operating expenses. Up goes operating expense and down comes the axe to prevent net from falling off badly. Unusually high fuel bills for steam generation, due to an extremely dry year all up and down the Coast, are another reason for mounting operating expenses.

Economy measures have taken the form of reduced forces, straight salary cuts and the five-day week with corresponding pay. Whether utility executives are short-sighted in effecting drastic economies at this time is another matter entirely. Possibly this is a time for accelerated maintenance programs and concentration on a reduction in distribution losses. Just as an overbuilt physical structure has proved a life saver, so will the maintenance of a strong and fully manned organization prove advantageous when business turns upward.

A Plan for Stabilization of Industry

By GERARD SWOPE

President General Electric Company

IN THE situation that confronts us at present, the most disturbing aspect is that men who are able to work, who are competent workers, who above all things desire to work, cannot find work to do. That this condition has ever been present in such periods detracts nothing from its wrongness. That industry must evolve and make effective those measures which will first ameliorate and ultimately eliminate it must be the reaction of every one who gives thought to what is taking place. I say that industry must do this thing, because it will surely be done.

Benefits earned by a worker in one employment are wholly or in large measure lost by forced changes, or the right of choice of employment, which should be inalienable, is hampered. From the operation of individual life insurance and pension systems, however well conceived, has arisen the complaint of the "40-year dead line," which, it is claimed, has seriously affected the ability of men exceeding that age to find new employment. Wide application is essential if benefits gained in one location are to follow the worker as necessity may indicate change of location, and this is a vital factor of any plan which will meet the need. If there were provided in the United States a system of benefits accruing through the life of the worker and following him where he might go, from shop to shop within a particular industry, or from branch to branch within industry as a whole, such provision would enlist, not merely interest on the part of the worker, but enthusiastic support.

Industry exists basically for serving the needs of the people, and therefore production and consumption must be co-ordinated. Consumption is by the mass of the population, not the few, and the great mass of the population is made up of wage earners and their dependents. That they may be able to buy and satisfy their needs they must have not only adequate incomes, but must be sufficiently assured of the future to feel that they are safe in spending their money. The psychology of fear must be removed, and this cannot be done unless they have reasonable expectation of protection for their families in case of the breadwinner's death, protection for their old age, and protection against unemployment. By "protection" I do not mean a protection that is given to them, but I mean protection that they themselves help to provide.

Shall we wait for society to act through its legislatures, or shall industry recognize its obligation to its employees and to the public and undertake the task? Co-ordination of production is impossible under our present laws, and it is vain to think of their amendment or repeal unless the public is assured of the constructive nature of the steps industry will take, and that the interests of the public will be adequately safeguarded.

The general principles underlying what I am going to say are as follows:

Every effort should be made to stabilize industry and thereby stabilize employment to give the worker regularity and continuity of employment, and when this is impracticable, unemployment insurance should be provided.

Organized industry should take the lead, recognizing its responsibility to its employees, to the public, and to its stockholders—rather than that democratic society should act through its government. If the various states act, industry will be confronted with different solutions, lacking uniformity and imposing varying burdens, making competition on a national scale difficult. If either the individual states or the federal government act, the power of taxation has no economic restraints.

There should be standardized forms of reports so that stockholders may be properly informed. As a result of the steady increase in number and size of corporations and number of shareholders, there has been much discussion of the uniformity, frequency and regularity of reports of corporate activities, and considerable criticism of the form of these reports; some too conservative, some not sufficiently complete; while others are considered to be fair and complete, but even so there is a lack of uniformity among the different companies.

*Presented before the National Electrical Manufacturers' Association, September 16, 1931.

Production and consumption should be co-ordinated on a broader and more intelligent basis, thus tending to regularize employment and thereby removing fear from the minds of the workers as to continuity of employment; as to their surviving dependents in case of death, and as to old age. This should be done preferably by the joint participation and joint administration of management and employees. These things cannot be done by an individual unit—organized industry must do them.

If organized industry is to undertake this work, every effort should be made to preserve the benefits of individual originality, initiative and enterprise, and to see that the public is assured that its interests will be protected, and this can be done most effectively by working through the agency of the federal government.

The following plan is offered as a means to correlate into a comprehensive whole the at present undirected efforts of forward-looking business enterprises toward stabilization, for the further development of industry and commerce, for the protection of employees and stockholders, for the best service to the public and, in general, the best interests of society. Legislation will be required to make such a plan possible, including the probable modification of some existing laws.

An outline of the more important features follows:

All industrial and commercial companies (including subsidiaries) with 50 or more employees, and doing an interstate business, may form a trade association which shall be under the supervision of a federal body referred to later.

These trade associations may outline trade practices, business ethics, methods of standard accounting and cost practice, standard forms of balance sheet and earnings statement, etc., and may collect and distribute information on volume of business transacted, inventories of merchandise on hand, simplification and standardization of products, stabilization of prices and all matters which may arise from time to time relating to the growth and development of industry and commerce in order to promote stabilization of employment and give the best service to the public. Much of this sort of exchange of information and data is already being carried on by trade associations that are at present in existence. A great deal more valuable work of this character is possible.

The public interest shall be protected by the supervision of companies and trade associations by the Federal Trade Commission or by a bureau of the Department of Commerce or by some federal supervisory body specially constituted.

All companies within the scope of this plan shall be required to adopt standard accounting and cost systems and standardized forms of balance sheet and earnings statement. These systems and forms may differ for the different industries, but will follow a uniform plan for each industry as adopted by the trade association and approved by the federal supervisory body.

All companies with participants or stockholders numbering 25 or more, and living in more than one state, shall send to its participants or stockholders and to the supervisory body at least once each quarter a statement of their business and earnings in the prescribed form. At least once each year they shall send to the participants or stockholders and to the supervisory body a complete balance sheet and earnings statement in the prescribed form. In this way the owners will be kept informed of the conditions of the business in such detail that there may be no criticism of irregularity or infrequency of statements or methods of presentation.

The federal supervisory body shall co-operate with the Internal Revenue Department and the trade associations in developing for each industry standardized forms of balance sheet and income statement, depending upon the character of the business, for the purpose of reconciling methods of reporting assets and income with the basis of values and income calculated for federal tax purposes.

All of the companies of the character described herein may immediately adopt the provisions of this plan, but shall be required to do so within three years unless the time is extended by the federal supervisory body. Similar companies formed after the plan becomes effective may come in at once, but shall be required to come in before the expiration of three years from the date of their organization unless the time is extended by the federal supervisory body.

For the protection of employees, the following plans shall be adopted by all of these companies:

Plan for the Protection of Employees

(Slightly abridged)

A WORKMEN'S COMPENSATION ACT, which shall be modeled after the best features of the laws which have been enacted by the several states.

LIFE AND DISABILITY INSURANCE. All employees of companies included in this plan may, after two years of service with such companies, and shall, before the expiration of five years of service, be covered by life and disability insurance.

The form of policy shall be determined by the association of which the company is a member and approved by the federal supervisory body. The policy will belong to the employee and may be retained by him and kept in full force when he changes his employment or otherwise discontinues particular service as outlined later.

The face value of a policy shall be for an amount approximately equal to one year's pay, but not more than $5,000, with the exception that the employee may, if he desires, increase at his own cost the amount of insurance carried, subject to the approval of the board of administrators.

The cost of this life and disability insurance shall be paid one-half by the employee and one-half by the company for which he works, with the following exception: The company's cost shall be determined on the basis of premiums at actual age of employees less than 35 years old and on the basis of 35 years of age for all employees 35 or over and shall be a face value of approximately one-half a year's pay but limited to a maximum premium for $2,500 of insurance. An employee taking out insurance at age 35 or over will pay the excess premium over the amount based upon age 35. This will remove the necessity for restriction against engaging employees or transferring them from one company to another because of advanced age, as it will place no undue burden of high premiums upon the company.

Provision for the continuation of a policy after an employee leaves one company and goes to another in the same association, or goes to a company in another trade association; continuance of the policy after retirement on pension; provisions with regard to beneficiaries; total or partial disability; method of payment of premiums by payroll deductions or otherwise, weekly, monthly or annually, shall be embodied in the plan formulated by the trade association, with the approval of the federal supervisory body.

If an employee leaves a company to go with one which is not a member of the trade association; if he engages in business for himself, or if he withdraws from industrial or commercial occupation, he may elect to retain the portion of the policy for which he has paid, in whole or in part, by the continued payment of the proportional full premium costs, or he may receive a paid-up policy, or be paid the cash surrender value for the part for which he has been paying the premiums. The

cash surrender value of that portion of the policy paid for by the company will be paid to the company which paid the premiums.

PENSIONS. All employees of companies included in this plan shall be covered by old age pension plans which will be adopted by the trade associations and approved by the federal supervisory body. The principal provisions will be as follows:

All employees may, after two years of service with a company coming within the scope of this plan, and shall, before the expiration of five years of service, be covered by the old-age pension plan.

All employees after two years' service may, and after five years' service shall be required to, put aside a minimum of 1 per cent of earnings, but not more than $50 per year, for the pension fund. The employee may, if he desires, put aside a larger amount, subject to the approval of the board of administrators.

The company shall be required to put aside an amount equal to the minimum stated above, namely, 1 per cent of earnings of employees, but not more than $50 per year per employee.

The above minimum percentage shall be the same for all employees who are less than 35 years of age when payments begin and the minimum percentage for these employees shall remain the same thereafter. The percentage to be set aside by employees coming into the pension plan at 35 years of age or over shall be so determined that it will provide a retiring allowance at age 70 the same as though they had begun 1 per cent payments at the age of 35. These provisions enable employees to go from one company to another in the same association or to different associations at any age with provison for retiring allowance which will be not less than the minimum rate of an employee who entered the pension plan at age 35.

The administration of the pension plan for each company shall be under the direction of a board of administrators, consisting of representatives, one-half appointed by the management and one-half elected by the employee members.

The amounts collected from the employees and the companies shall be placed with a pension trust organized by the association, the management of which shall be under the direction of the general board of administration. In no case shall such funds be left under the control of an individual company.

The pension trust shall invest all funds and place them to the credit of the individual employees, including the income earned by the trust. If an employee goes from one company to another in the same association, the funds accumulated to his credit shall be continued to his credit with proper record of transfer. If an employee goes to a company in another association, the funds accumulated to his credit shall be transferred to his credit in the pension trust of the association to which he goes. If an employee goes to a company which does not come under these provisions or which is not a member of a trade association; goes into business for himself, or withdraws from an industrial or commercial occupation, the amount of his payments plus the interest at the average rate earned by the funds shall be given to him. If an employee dies before reaching retirement age his beneficiary will receive the amount of his payments plus interest at the average rate earned by the funds.

When an employee reaches retirement age the entire amount accumulated to his credit, including his own payments and those of the company, plus accumulated interest, will be given to him in the form of an annuity. If an employee goes to a company which does not come under these provisions or which is not a member of a trade association; goes into business for himself, or withdraws from industrial or commercial occupation, he may elect to let the amount to his credit (namely, his own payments plus those of the company and the accumulated interest) remain with the pension trust for transfer, if he should return to the employ of any company coming within the provisions of this plan. If he does not return to the employ of a company coming under these provisions he may at any time thereafter withdraw the amount of his own payments plus interest at the average rate earned by the funds up to that time.

Company contributions and accumulated interest credited to employees who die or, for reasons indicated above, receive or withdraw their own contributions and interest, shall be returned to the employer or employers who made the contributions.

UNEMPLOYMENT INSURANCE. All employees on piece work, hourly work, daily, weekly, or monthly work, with normal pay of $5,000 per year or less (approximately $96.15 per week) shall be covered by unemployment insurance.

All such employees may, after two years of service with a company coming within the provisions of this plan, and shall, after five years of service, be each required to put aside a minimum of 1 per cent of earnings, but not more than $50 per year for an unemployment insurance fund.

The company shall be required to put aside an amount equal to that put aside by the employees, as set forth above, namely, 1 per cent of the earnings of each employee, but not more than $50 per year for each such employee.

If a company regularizes and guarantees employment for at least 50 per cent of the normal wage paid each year to such employees, the company assessment for employees covered by such guarantee need not be made, but the employees will pay in a minimum of 1 per cent of earnings, but not more than $50 per year, into a special fund for their own benefit.

If such an employee leaves the company, dies or retires on pension the amount to his credit in the special fund, plus interest at the average rate earned by the special fund, shall be given to him or to his beneficiaries or added to his pension.

If a company so plans its work that it is able to reduce unemployment, when the amount of such company's credit in the normal unemployment fund is equal to but not less than 5 per cent of the normal annual earnings of the employees covered, the company may cease making payment to the fund. Employees' payments will continue. The company will resume payments when its credit in the normal unemployment fund falls below 5 per cent of normal annual earnings of the employees covered.

When the weekly payments made from the fund for unemployment benefits amount to 2 per cent or more of the average weekly earnings of participating employees the company shall declare an unemployment emergency, and normal payments by the employees and the company shall cease. Thereafter *all* employees of the company (including the highest officers) receiving 50 per cent or more of their average full-time earnings shall pay 1 per cent of their current earnings to the unemployment fund. A similar amount shall be paid into the fund by the company. The unemployment emergency shall continue until normal conditions are restored, which shall be determined by the board of administrators of each company. Thereupon normal payments will be resumed.

The main provisions for the distribution of the funds shall follow along these lines, unless modified by the board of administrators as set forth in the following paragraph. A certain small percentage of the normal payments of the employees and the company may be considered as available for helping participating employees in need. A larger percentage of such normal payments may be considered as available for loans to participating employees in amounts not exceeding $200 each, with or without interest as may be determined by the board. The balance of the funds shall be available for unemployment payments. Unemployment payments shall begin after the first two weeks of unemployment and shall amount to approximately 50 per cent of the participating employee's average weekly or monthly earnings for full time, but in no case more than $20 per week. Such payments to individual employees shall continue for no longer than ten weeks in any twelve consecutive months unless extended by the board. When a participating employee is working part time because of lack of work and receiving less than 50 per cent of his average weekly or monthly earnings for full time, he shall be eligible for payments to be made from the fund, amounting to the difference between the amount he is receiving as wages from the company and the maximum he may be entitled to as outlined above.

The custody and investment of funds and administration of the unemployment insurance plan for each company shall be under the direction of a board of administrators consisting of representatives, one-half appointed by the management and one-half elected by the employee members.

If an employee leaves the company and goes to work for another company coming within the provisions of this plan, the proportionate amount remaining of his normal contributions, plus interest at the average rate earned by the funds, shall be transferred to such company and to his credit. If he leaves for other reasons, dies or retires on pension the proportionate amount remaining of his normal payment, plus interest at the average rate earned by the funds, shall be given to him, or to his beneficiary, or added to his pension. When such employer's credit is transferred to another company, or paid to the employee or to his beneficiary under this provision, an equal amount shall be paid to the co-operating company.

Oil Blast Extended to Other Breakers

By D. C. PRICE and W. E. PAUL

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Results of tests show that where 1½ to 8 cycles and 2 to 9.3-in. arc lengths were required before a circuit could be interrupted with plain-baffle type FH breaker, the new oil blast baffle has reduced the arc duration to ½ to 1¼ cycles and the arc length to 0.8 to 1.8-in. Similar but not so large improvements were observed in FK breakers to which the oil-blast principle was adapted in a different way. As a result the ratings which can be accommodated in different size tanks can be greatly increased and space thereby conserved.

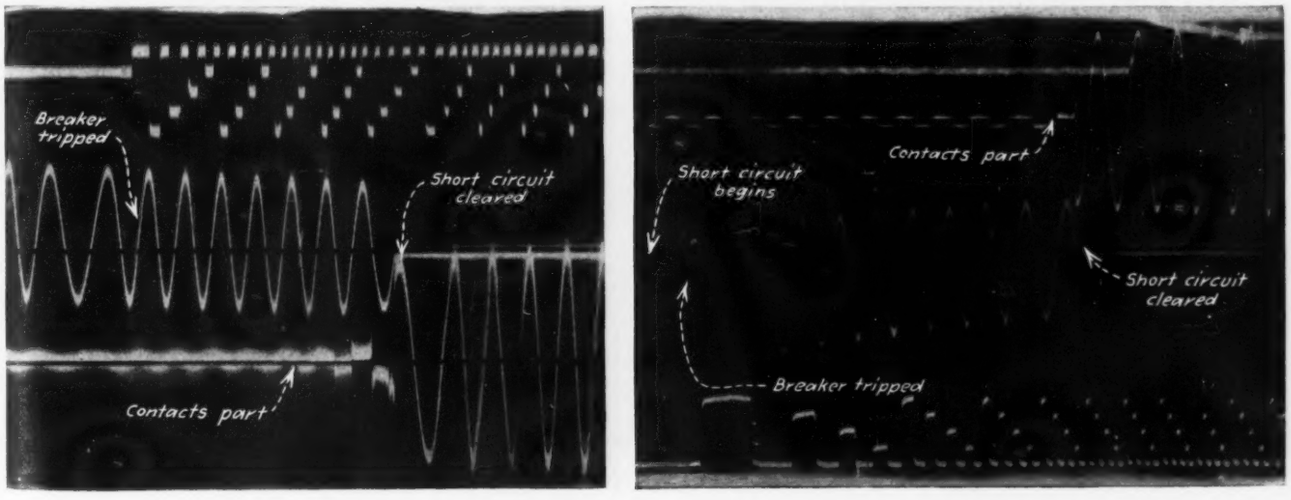
ONE way to prove a theory is to apply it under conditions materially different from those under which it was first conceived and observe the results. With this in mind, several applications of the oil-blast principle, tried so successfully on high-voltage explosion-chamber oil circuit breakers, have been made.

A typical oscillogram showing the operation of an FH oil circuit breaker is shown in Fig. 1 and a typical series of tests are reported in Table I. To secure effective oil-blast explosion chamber action the baffle arrangement of Fig. 3 has been developed. The standard rod-and-segment contact has been retained because of the need of a form of contact having a large momentary capacity to which current can be transferred as the initial movement disengages the heavy current contacts. When the rod and segments disengage an arc is drawn which creates pressure on the oil. This pressure would normally be relieved by a blast of gas following the contact rod. Such a discharge is, however, prevented by closing of the gates. As the contact rod passes the gates the arc is divided into two portions, one between the contact bell and the gates, the other between the gates and the contact rod. The entrapped gases from the lower arc have no means of egress except by the passage, which is filled with solid oil. As the gases expand a solid stream of oil is driven between the gates and the contact rod. As the current zero is reached this blast of oil sweeps away the arc products, replacing them by solid oil of high dielectric strength, which the recovery voltage is not able to break down.

An oscillogram of an "H" type circuit breaker with oil-blast baffles tested under conditions comparable to those of Fig. 1 is shown in Fig. 2. The arc duration has been reduced to one cycle. Table II, which is comparable to Table I, shows the great improvement obtained by the application of the oil-blast principle. Comparing tables I and II, it will be noted that instead of arc durations from 1½ to 8 cycles, the oil-blast arrangement gives arc durations from ½ to 1¼ cycles. Instead of arc lengths from 2 to 9.3 in., the oil-blast design has arc

Figs. 1 and 2—How rupturing performance is affected by oil-blast baffles

Oscillogram at left applies to single-phase type FH breaker with plain baffles (see test 13, Table I), while one at right applies to similar breaker with oil-blast baffles (test 44, Table II). The first interrupted 13,200 r.m.s. amperes at 13,200 volts, whereas the latter ruptured 15,800 amp. at same voltage.



lengths from 0.8 to 1.8 in. A marked reduction in pressure has also been brought about both above the oil and in the arc chamber. By employing this modification, the rating of the 8-in. tank breaker may be conservatively increased from 350,000 kva. to 500,000 kva., the 10-in. from 500,000 kva. to 1,000,000 kva. and the 12-in. from 750,000 kva. to 1,500,000 kva.

A general idea of the relative sizes of the 500,000-kva. capacity is given by Fig. 4, which shows one single-pole unit of the old type and one of the new oil-blast types. The structure of this oil-blast arrangement is materially different from that employed in the high-voltage oil-blast explosion chamber circuit breaker in that the blast is now transverse instead of radial and the oil direction is secured by means of gates instead of by an intermediate contact. These differences are dictated by various con-

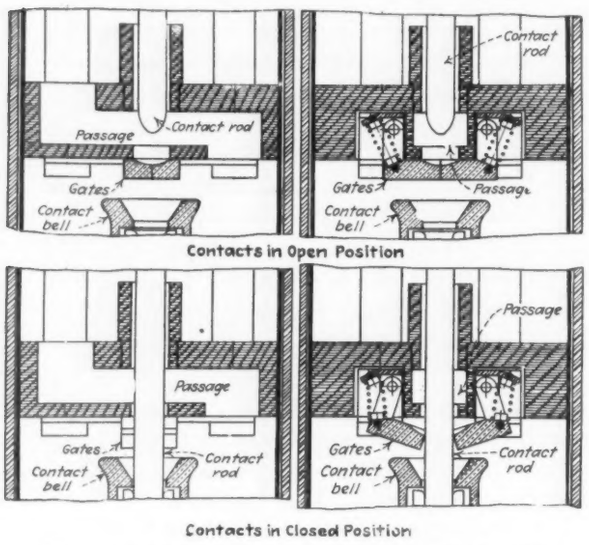


Fig. 3—Oil-blast baffle applied to FH breaker

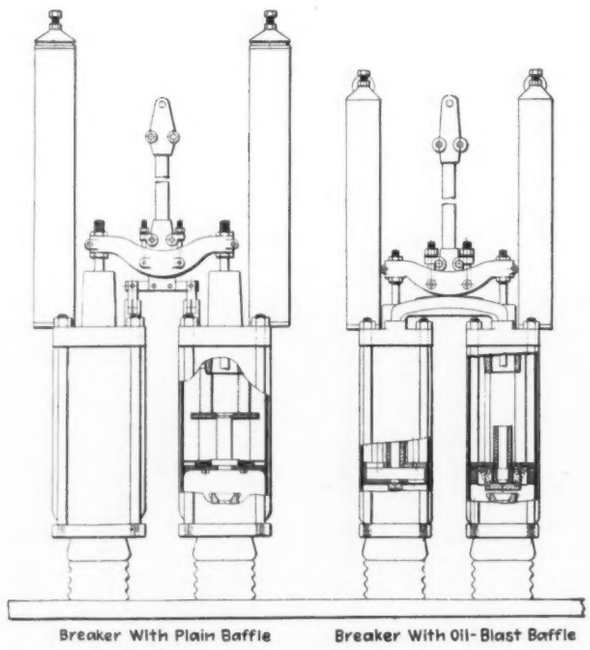


Fig. 4—Same rupturing capacity in less space with oil-blast baffle

Both breakers are rated at 500,000 kva. rupturing capacity, but one at left has plain baffles while one at right has oil-blast baffles.

Tables I to IV—Arc Duration, Arc Length and Gas Pressures Reduced by Oil-Blast Principle

Type H Breaker, Plain Baffle

Test Number	Single or Three Phase	Test Voltage	Amperes Interrupted	Equivalent Three Phase Kva. Interrupted	Test Frequency	Arc Duration		Pressure, Lb./Sq.In.	
						Cycles	In. per Break	Above Oil	Arcing Chamber
1	Single	13,200	1,080	28,500	60	8	9.3	45	55
2	Single	13,200	1,090	28,800	60	7.5	9.0	73	73
3	Single	13,200	1,130	29,800	60	7.5	9.0	35	45
4	Single	13,200	6,000	159,000	60	3.1	4.7	45	53
5	Single	13,200	5,950	157,000	60	3.25	4.5	30	53
6	Single	13,200	5,850	154,000	60	5	6.5	85	82
7	Single	13,200	5,900	156,000	60	3.5	5.0	137	193
8	Single	13,200	5,800	153,000	60	3.35	4.5	40	15
9	Single	13,200	5,750	152,000	60	3.95	5.3	112	90
10	Single	13,200	13,500	356,000	60	1.75	3.8	118	305
11	Single	13,200	13,200	348,000	60	2.0	3.0	Low	70
12	Single	13,200	13,300	351,000	60	2.25	4.0	70	128
13	Single	13,200	13,200	348,000	60	2.5	4.0	172	250
14	Single	13,200	13,200	348,000	60	1.75	3.0	93	313
15	Single	13,200	13,100	345,000	60	2.0	3.0	93	159
16	Single	6,500	19,800	257,000	60	1.4	2.3	125	350
17	Single	6,500	19,800	257,000	60	1.4	2.0	73	150
18	Single	6,500	20,200	262,000	60	1.75	3.0	73	123
19	Single	6,500	21,000	273,000	60	1.85	3.5	153	280
20	Single	4,200	37,600	316,000	60	1.85	4.0	125	225
21	Single	4,200	42,000	353,000	60	1.5	3.5	170	265

Type H Breaker, Oil-Blast Baffle

35	Single	13,200	1,160	30,600	60	0.75	1.1	Very low	20
36	Single	13,200	1,900	50,000	60	0.75	1.1		26
37	Single	13,200	3,300	87,000	60	0.75	1.3		46
38	Single	13,200	5,570	147,000	60	0.5	0.8		50
39	Single	13,200	7,960	210,000	60	0.75	1.1		67
40	Single	13,200	10,600	280,000	60	0.75	1.1		88
41	Single	13,200	11,900	314,000	60	1.0	1.6	4	79
42	Single	13,200	12,800	338,000	60	0.75	1.1	4	104
43	Single	13,200	13,800	364,000	60	1.0	1.6	17	122
44	Single	13,200	15,800	417,000	60	0.75	1.3	8	104
45	Single	14,500	17,000	493,000	60	0.5	0.8	Very low	104
46	Single	8,400	28,100	472,000	60	0.75	1.6	52	197
47	Single	4,200	2,540	21,400	60	0.75	1.3	Very low	4
48	Single	13,200	5,440	144,000	60	1.25	1.8	Very low	18
49	Single	4,200	40,000	336,000	60	0.75	1.1	38	173

Type K Breaker, Plain Break

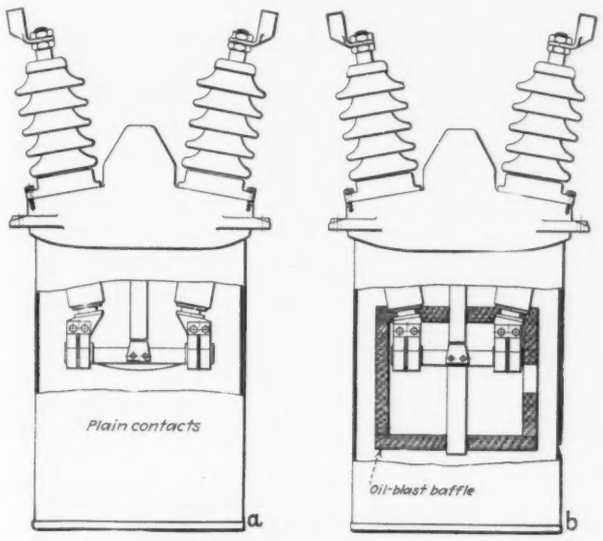
2	Single	4,000	400	3,200	60	1.8	1.5	Low	Low
3	Single	4,000	680	5,400	60	3.125	2.75	Low	Low
4	Single	4,000	880	7,000	60	3.8	3.00	Low	2
5	Single	4,000	1,320	10,500	60	3.2	2.75	2	2
6	Single	4,000	1,620	13,000	60	3.5	3.00	Poor record	5
7	Single	4,000	3,180	25,400	60	3.0	2.75		
8	Single	4,000	4,000	32,000	60	7.75	3.50	6	10
9	Single	4,000	4,650	37,200	60	3.75	2.50	11	20
10	Single	4,000	6,930	55,500	60	4.75	2.25	17	24

Type K Breaker, Oil-Blast Explosion Chamber

70	Single	13,200	1,000	26,000	60	1.75	0.8	Very low	33
71	Single	13,200	1,900	50,000	60	1.5	0.8		35
72	Single	13,200	3,500	92,000	60	1.0	0.5		53
73	Single	13,200	5,500	145,000	60	1.0	0.5		59
74	Single	13,200	Breaker did not trip						
75	Single	13,200	8,200	217,000	60	0.75	0.5		61
76	Single	13,200	10,500	277,000	60	0.75	0.5		41
110	Single	4,000	400	3,200	60	1.5	1.5		15
111	Single	4,000	790	6,300	60	1.25	1.3		20
112	Single	4,000	1,310	10,500	60	1.0	1.3	Very low	11
113	Single	4,000	2,400	19,200	60	0.75	0.8		36
114	Single	4,000	4,420	35,200	60	0.5	0.5		58
115	Single	4,000	7,600	60,800	60	0.75	0.8		66
116	Single	4,000	12,600	101,000	60	0.5	0.5		51
117	Single	4,000	19,700	158,000	60	0.25	0.3		97

siderations. A smaller diameter of contact rod can be used which is of some importance where the rod must pass through an oil-tight packing gland. The gated arrangement obviously is not as fast mechanically as the butt contact, since the tip of the contact rod must move nearly 6 in. before the final arc is drawn. Once the blast of oil is established, however, the arcing time is extremely short, as shown by the oscillogram and table. The arcing time after the contact rod has passed the gates averages less than one cycle.

A very large number of oil circuit breakers are made for interrupting capacities under 100,000 kva. These circuit breakers are essentially low-cost devices, but their capacity is small. They uniformly possess two breaks per pole between the two bushings and the moving blade or crosshead.



Figs. 5 a and b—Adding oil-blast baffle increased rupturing capacity 437 per cent

Breaker at left is rated at 40,000 kva. rupturing capacity, while one at right is 175,000 kva., both at 15,000 volts.

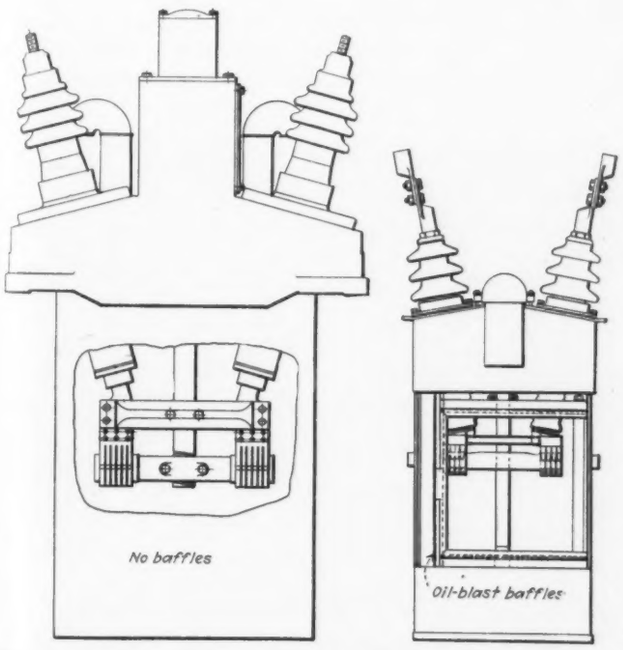


Fig. 6—Comparative sizes of 175,000-kva., 150,000-volt breakers with and without oil-blast baffle

The interruption of a circuit in a plain-break circuit breaker depends upon the drawing of an arc which, due to inherent magnetic blowout or accidental turbulence of the oil, will ultimately be broken up at the current zero by partitions of solid oil thick enough to withstand puncture by the recovery voltage across the circuit breaker terminals. This procedure can be replaced by a perfectly positive and definite oil-blast action by inclosing the two breaks in such a way that pressure from the gas bubble at one break will propel a blast of solid oil across the second break. Fig. 5a shows a typical 15,000-volt, 40,000-kva. outdoor oil circuit breaker. Table III gives its performance on a typical series of tests. Fig. 5b shows a modification of this circuit breaker with the oil-blast principle. Its interrupting rating is 175,000 kva. Table IV gives the results of a test series comparable to Table III, but with the oil-blast chamber.

These tests show that the maximum arc duration is reduced from 7.75 cycles to 1.75 cycles and arc length from $3\frac{1}{2}$ to $1\frac{1}{2}$ in., even though 13,000-volt tests are included in the oil-blast chamber series. It will be noted that it has not been necessary to change the type of contacts in either of these applications, so that the experience of years on the contacts best able to withstand heavy momentary currents and carry full load continuously without heating can be fully utilized. Here again the oil-blast principle has amply justified itself in an application bearing almost no superficial resemblance to the high-voltage designs.

Not so long ago a circuit breaker of the size shown in Fig. 6 (left) was required to interrupt 175,000 kva. at 15,000 volts and many circuit breakers of this type are still in use. By employing the oil-blast principle the circuit breaker shown in Fig. 6 (right) is able to handle the same duty with an assured margin of safety.

All of the tests here mentioned have been made in a high-power testing plant which has been proved to impose duty much more severe than the usual system. Voltage recovery rates obtained with the test generator and reactors are as high as or higher than the worst obtained in commercial practice, thus providing assurance for the adequacy of designs obtainable in no other way.

▼

Diesel-Electric Traction for Britain

An alternative proposal to the Weir scheme for the electrification of the British railroad systems has now been laid before the government. This is for the adoption of Diesel-electric traction, by which, its advocates say, the same improvements would be achieved as by complete electrification and at a saving to the nation of tens of millions. Figures adduced put the Diesel-engine cost at $750,000,000, as compared with the $1,700,000,000 which the Weir plan would cost. The return on the capital invested would also, the advocates say, work out at 15 per cent, as compared with $6\frac{1}{2}$. While undoubtedly permanent-way electrification is the most economical and efficient method of transport for suburban and other heavy traffic, it is held to be unnecessary on those parts of the railway system where traffic is not very dense.

Reactance Relays Negligibly Affected by Arc Impedance

By A. R. VAN C. WARRINGTON

Switchgear Department, General Electric Company, Philadelphia, Pa.

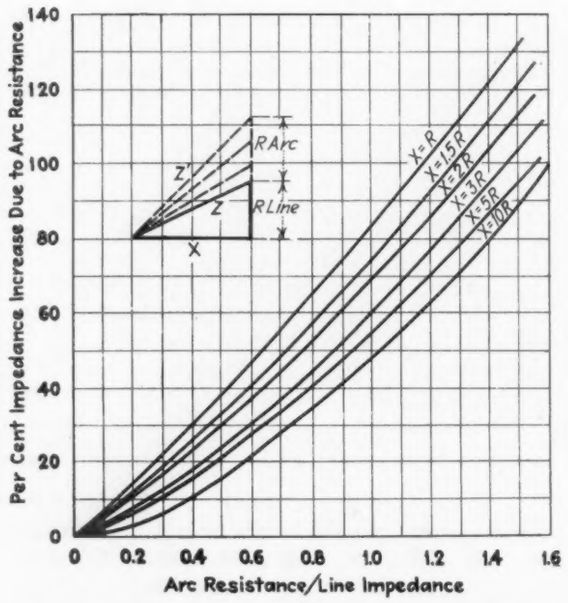


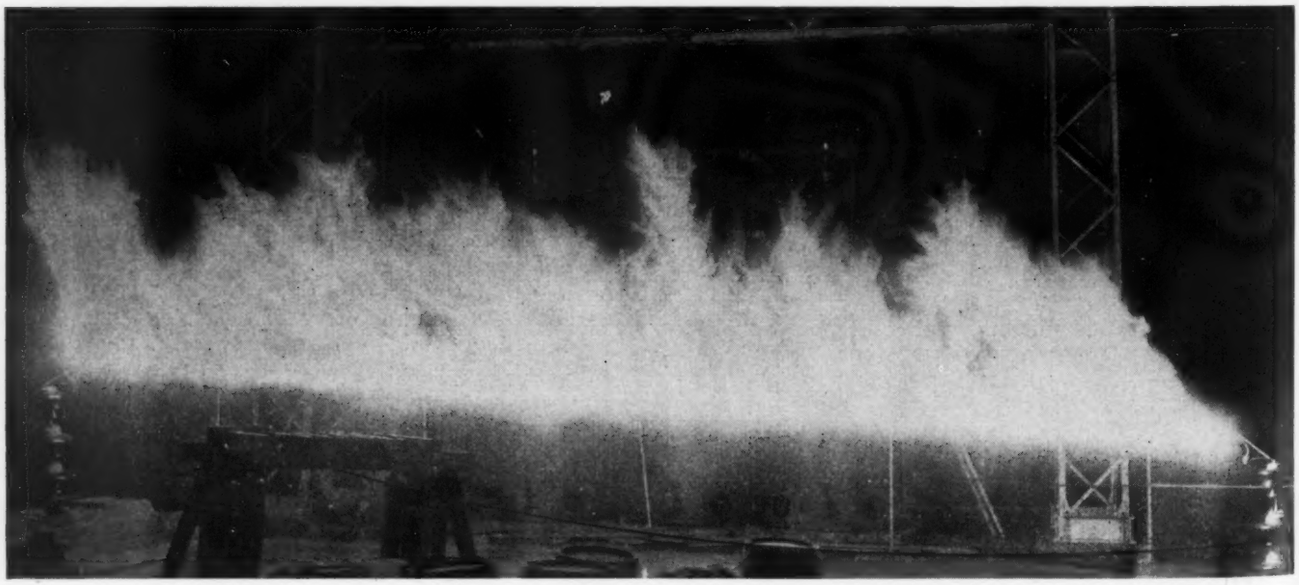
Fig. 1—Arc resistance significant on short lines

ELABORATE field tests with high-speed oscillographs on the high-voltage systems of the New England Power Association and the Tennessee Electric Power Company during the past two years have provided valuable data on the proper application of impedance and reactance relays. The results of some of these tests (given in the table) indicate that arc impedance is mostly resistance and does not therefore affect the distance performance of reactance relays.

The distance measurement of an impedance relay is based upon the impedance of the line between the relay and the fault plus that of the fault. Because of this an arcing fault will cause the impedance relay to operate as though the fault were more distant than it actually is.

This tendency depends upon the percentage of the arc impedance with respect to the impedance of the section; i.e., on very long sections the impedance of the arc may be negligible and may not have any appreciable effect on the operation of the impedance relay. But the impedance of the same arc occurring at the end of a short section may be comparable to, or even greater than, that of the

Fig. 2—Forty feet of 144-kv. arc
Line-to-line arc on single phase carrying 120 amp.



section and, in this case, cannot fail to have some effect. The extent of this effect is illustrated in Fig. 1, in a family of curves showing theoretically the relationship between the arc impedance and its effect on the operation of the relay.

If the arc increases the resistance component of the line impedance, but does not add to the reactance component, it would appear that, if the ohmic relay were designed to operate in accordance with the reactive component of the line impedance only, such a relay would not be affected by the magnitude of the voltage across the arc.

Field tests have been made the results of which have indicated reactance in the arc. On the other hand, it was observed in tests on the Tennessee Electric Power and other systems that even long arcs had no appreciable effect on the ohmic indication of relays of the reactance type.

The reason for this can be understood if the test conditions are analyzed. There are four apparent sources of reactance in the arc: Observation difficulties, wave shape, instrument transformer error, and current not measured by the relay.

1. *Observation Difficulties.* — The standard type of phase-angle meter is prone to sluggishness and overtravel. Experience with these tests has indicated that it is seldom convenient to leave a fault on a system long enough to obtain accurate data from instruments which are ordinarily employed.

It was found that, with the ordinary oscillograph, the waves were so crowded on the film that it was impossible to make a really accurate estimate of the phase angle between the arc voltage and current. With a high-speed oscillograph the arc current and arc voltage were in phase.

2. *Wave Shape Creates Apparent Reactance.*—Low power factors have been indicated, even in tests where the phase-angle meter has had ample time to reach its final position, because of the fact that the power factor of an arc can be less than unity and still have no reactive component. This is due to the distortion of the voltage and the current waves which give rise to a form factor, causing the fraction $\frac{\text{watts}}{\text{volt-amps.}}$ to be less than unity. This indicates a fictitious reactance which does not involve any interchange of energy each cycle, nor does it involve any angular displacement between the current and the arc voltage.

3. *Instrument Transformers.* — Near the limit of stability the arc current may start a little late each cycle. The missing initial part of the current wave tends to be smoothed out by current transformers giving a slightly lagging effect.

Similarly, in some potential transformers, the flux wave shape has a tendency to make the secondary voltage lead slightly. Both these effects will create a small apparent secondary reactance.

4. *Apparent Reactance Due to Current from Other End of Line.*—A distance relay may measure a fictitious positive or negative component of reactance in the arc due to the fact that the current in the relay does not include the current that is flowing in the arc from the other end of the line. This fictitious reactance will be small compared with the total reactance, except on extremely short sections, and in such cases pilot wire protection is usually possible. The error in distance measure-

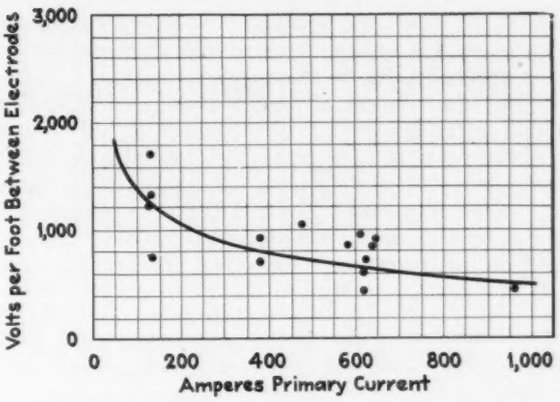


Fig. 3—Tests produce characteristic equation

Voltage is $\frac{8{,}750\ L}{\sqrt[n]{I}}$

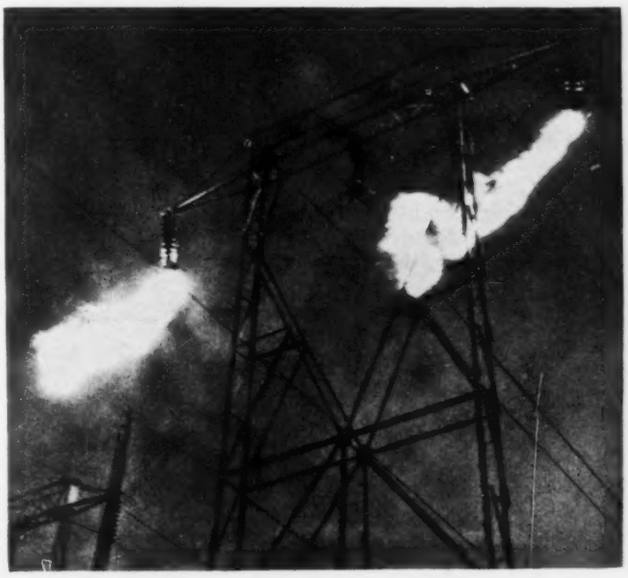


Fig. 4—Three 220-kv. phases arcing to ground

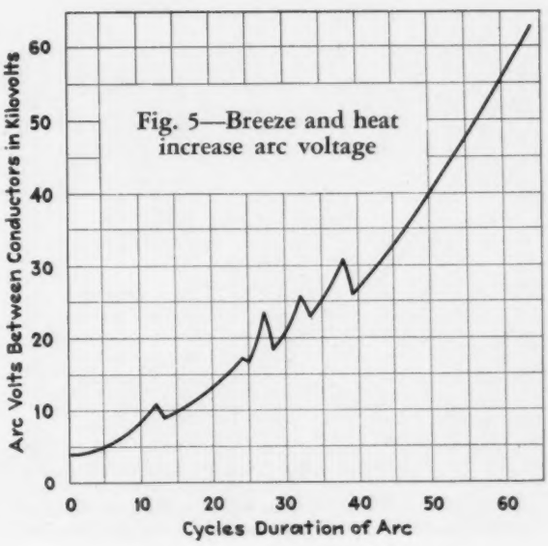


Fig. 5—Breeze and heat increase arc voltage

ment of the reactance relay due to this fictitious reactance will always be small compared with the error in the impedance relay due to the arc resistance.

Of the four sources of arc reactance the difficulties of reading instruments and oscillograms would obviously not affect the relay. In order to investigate the others a great number of system tests have been made, particularly on the Tennessee Electric Power System, and no appreciable difference was observed between the ohmic indication of reactance relays for arcing and metallic faults at the same location.

In another set of tests, on the same system, using high-speed oscillographs, the waves of arc kva. were 100 per cent offset in every test, showing that the arc kva. was 100 per cent watts. This was checked with one set of vibrators tuned to 75 cycles and another set tuned to 7,500 cycles, the first set reading r.m.s. and the second instantaneous values.

Laboratory tests have shown that the voltage across an arc consists of the sum of three terms—a basic voltage V_0, a term involving the current and the arc length, and a term involving, in addition, the volume of the arc and the rate of change of current through the arc.

The first term V_0 is of the order of 20 volts and is therefore negligible in high-voltage arcs. Owing to the difficulty of calculating the third term $\frac{K' v}{I^2} \cdot \frac{d I}{d t}$, it is advisable to avoid it if possible by making these tests under stable conditions of heat balance; i.e., in the absence of wind and with constant generating conditions. This leaves only the second term, giving an equation $V_{arc} = \frac{KL}{\sqrt[n]{I}}$ for the characteristics of a stable arc.

In an attempt to determine the constants K and n, values of V, I and L were read from oscillograms (see accompanying table) and plotted (see Fig. 3). The points were erratic but, after some of them were rejected as unreliable, probably because the third term was not negligible, a curve in the form of the above equation was drawn through the remainder and yielded values $K = 8{,}750$ and $n = 2.5$. The characteristic equation of a power arc is therefore $V = \frac{8{,}750\, L}{\sqrt[2.5]{I}}$, where L is in feet.

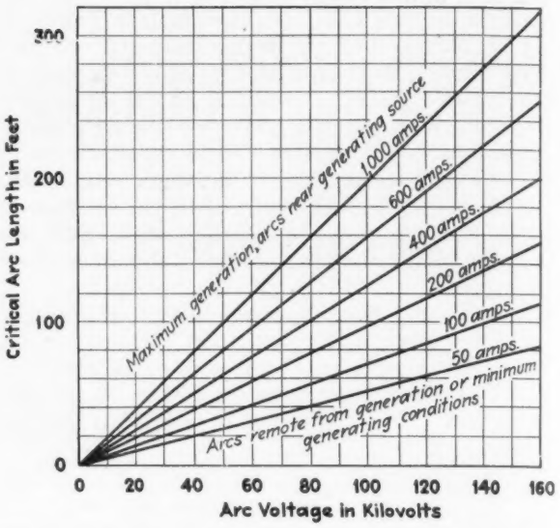


Fig. 6—Stability exists below critical arc lengths

In general, the results indicated higher arc impedance than was expected. It was felt, however, that if the arcs had been struck by lightning their impedance would have

Arc Data from Tests on High-Voltage Transmission Lines (Primary Values)

Test No.	System Voltage, Kv.	Type Fault	Length Between Electrodes, Feet	Data Taken After, Sec.	Record Device	Arc Amp.	Arc Volts	Per Cent Norm. Volts	V per Foot	Arc Z	Z per Foot	Arc Kva.	Kva. per Foot
1	110	Phase to Phase	4½	2	P-3 Meters	960	2,040	1.85	480	2.13	0.5	1,960	451
2	110		4½	2		640	4,000	3.63	940	6.25	1.48	2,560	606
3	110		4½	1½		640	3,740	3.40	870	5.84	1.39	2,395	564
4	110		4½	2		624	3,072	2.79	715	4.93	1.16	1,930	453
5	110		4½	3		592	3,600	3.27	850	6.10	1.44	2,130	500
6	110		4½	2½		480	4,560	4.14	1070	9.50	2.24	2,190	515
7	115	Phase to Ground	6	2		698	4,150	3.77	.....	5.94	....	2,890	.....
7	115		6	3		605	4,400	4.0	.....	7.28	....	2,660	.....
7	115		6	15		605	10,280	9.34	.....	17.0	....	6,230	.....
7A	115		6	30		322	21,000	19.1	.....	65.3	.....	7,670	.....
7A	115		6	50		322	38,400	34.9	.....	119.3	....	12,370	.....
7A	115		6	57		322	61,500	55.9	.....	190.8	....	19,820	.....
8	154	Phase to Phase	12	3 Cycle	Oscillograph	405	15,200	14.0	1260	53.0	4.42	8,720	727
8	154		12	33		405	23,100	15.1	1916.5	57.0	4.73	9,350	780
9	154		30	3		385	20,200	13.1	673	52.5	1.75	7,780	259.3
9	154		30	35		385	30,700	18.2	1023	79.7	2.66	11,830	394
10	154		40	3		385	25,300	16.5	632	65.8	1.67	9,750	243.7
10	154		40	10		385	28,000	18.2	700	72.8	1.82	10,800	270
10	154		40	30		385	35,000	23.0	875	90.8	2.27	13,500	337
11	154		40	3		135	22,000	14.3	550	163.0	4.07	2,970	767.5
11	154		40	20		135	30,800	20.0	770	228	5.7	4,150	103.8
11	154		40	70		135	51,000	33.1	1275	377	9.4	6,900	172.5
12	154		40	10		135	54,000	35.1	1350	400	10.0	7,300	182.5
12	154		40	40		135	58,300	37.9	1462	433	10.8	7,900	197
12	154		40	50		135	69,000	44.8	1725	511	12.8	9,320	233

Tests 1 to 6—(110 kv.) transformer ratios, potential 1,000/1; current transformers, 40/1.
Tests 7 to 7a—(115 kv.) transformer ratios, potential 1,000/1; current transformers, 440/1.
Tests 8 to 12—(154 kv.) transformer ratios, potential 1,300/1; current transformers, 45/1.
Arcs started, in each test, by a fuse of No. 18 copper wire.

been still higher, because the test arcs were started with fuses of No. 18 copper wire, the metallic vapor from which tends to lower the resistance of the arc stream. In later tests it was found that with very thin aluminum wire the initial arc resistance under comparable conditions is considerably higher.

Wind causes high arc resistance

If the arc is stable and the fault is not cleared immediately the wind may blow it out to a great length because its weight is negligible. For instance, a 30-mile-an-hour (44-ft.-per-second) gust of wind will move the crown of the arc 22 ft. in half a second. This means that an arc across conductors 14 ft. apart (110-kv. line) may stretch out to more than 50 ft. in half a second. Besides the effect of increasing length the arc resistance is further raised by the cooling effect of the wind, which causes deionization and reduction in cross-section of the arc. How rapidly the arc voltage rose during a system test in quite a light wind is shown in Fig. 5.

The arc will extinguish itself if the generated heat falls below the heat radiated from its surface. This may be caused by a drop in generation after the arc has attained its full size, or it may be caused by attenuation of the arc by the wind until the voltage per foot is not sufficient to maintain it. In other words, the arc becomes unstable if something happens which upsets the heat balance and makes V less than the value satisfying characteristic voltage equation given under the previous subheading. In Fig. 6 the critical stable limits are expressed as curves.

In tests Nos. 7 and 12 very long arcs were obtained. In test No. 7 a slight wind was blowing and in test No. 12 the arc was stretched artificially by having 40 ft. between electrodes. The secondary resistance of the arc in test No. 12 was 16 ohms. From Fig. 1 the effect of such an arc on the distance measurement of an impedance relay can be estimated.

System tests have shown that an impedance relay which should operate in intermediate time for a fault at the end of the protected section may operate in back-up time or even fail to operate faults involving long arcs, particularly on short lines, with reduced generation and in the presence of wind.

On the other hand, reactance relays were tried out in all of the tests except No. 7. Arcs were struck between conductors both near to and remote from the substation where the reactance relays were installed and in all cases the relays gave essentially the same indication of ohms for arcing faults as they did for metallic faults at the same location.

▼

Bunched Flame-Proof Wire Makes Compact Rheostat Installation

Calculating Lamp Burn-Outs

By H. H. WEBB

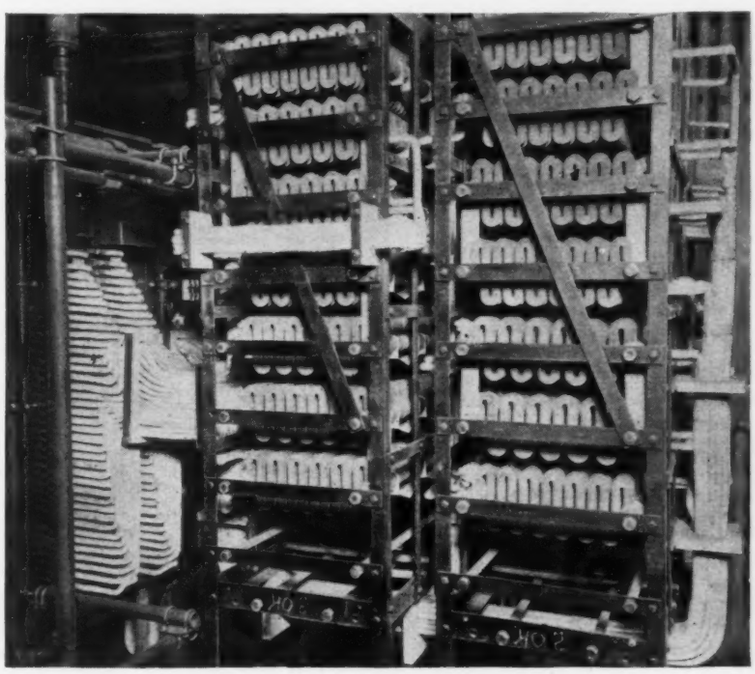
Illuminating Engineer
Dayton Power & Light Company, Dayton, Ohio

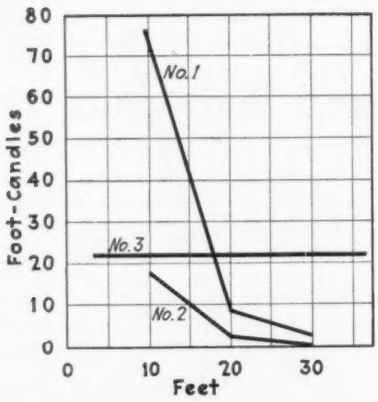
Of all electric devices in common use, those most seriously affected by a few volts variation from normal are incandescent lamps. Although only from one-tenth to one-sixth of lighting cost is the cost of lamp replacement, most persons experience a feeling of disappointment when a few more lamps burn out than did the previous month. Take the case of a large store or office building, where normal lamp life means that 100 lamps per month is the normal rate of burn-out, but where, owing to low voltage occasioned by inadequate wiring, the actual rate of burn-out is 30 lamps per month. The manager of the enterprise is alarmed if this jumps to 50 in any particular month. It is usually difficult to convince the customer that his lamp bills are not excessive, especially if it is hard to collect all of the necessary data on which to base an accurate estimate. For this reason I would like to suggest a simple formula for calculating the normal rate of burn-out of lamps:

$$\text{Burn-outs per month} = \frac{\text{Kw.-hr. per month used for lighting}}{\text{Average wattage of lamps}}$$

or, stated this way: $KWH \div W = KLH.$

KLH is simply thousands of lamp-hours of burning during the month. Since the normal life of a lamp is 1,000 hours, it also represents the number of expected burn-outs during the month. For example, an office building uses 5,000 kw.-hr. during a certain month and the average wattage of the lamps is 100. If the interior wiring is adequate and the voltage maintained properly, 50 lamp replacements per month may be expected.





Daylight and artificial light compared

Packard plant buildings are designed to utilize normal daylight. This graph of observed data in a particular building shows the variability of daylight and the uniformity of artificial light. The former, on a clear day (curve 1), varies with distance from windows from 76 to 3.5 foot-candles and on a cloudy day (curve 2) ranges from 17.6 to 0.8, while the artificial illumination (curve 3) remains uniform at 22.6 foot-candles over the whole area.

The Motor Car Is a

Light everywhere surrounds the building of the modern automobile. Along the way of production from foundry to finish line intensities range from 8 to 140 foot-candles, with the twenties ruling

AUTOMOBILE production demands always the ultimate in practical illumination. The visual precision necessary to the intricacies of machine work makes imperative the need for intensities well toward the maximum possibilities. Such illumination must not only be of sufficient intensity but must be properly diffused to eliminate objectionable shadows. Also there must be an avoidance of glare, as well as specular reflections from highly polished surfaces, which tend to cause eye discomfort, thereby decreasing the speed of vision and the instantaneous acuity of sight so necessary to the requirements of fine detail and quality production.

The value of high light intensities to effective productive output is recognized by the Packard Motor Car Company at Detroit, which has installed in each department an excellent and practical system of illumination. Since production schedules are predetermined and standards of quality are high, each operation, from the pouring of metal in the foundry to the final inspection of the completed car, must be carried out under unvarying lighting conditions that are impossible except with intelligent application of artificial light. That daylight alone will not do is shown by the accompanying graph of natural and artificial light intensities.

The captions give the particulars of illumination for the various operations illustrated in the pictures accompanying this article. Photographs of some operations were not available and the lighting data for these are presented in the following:

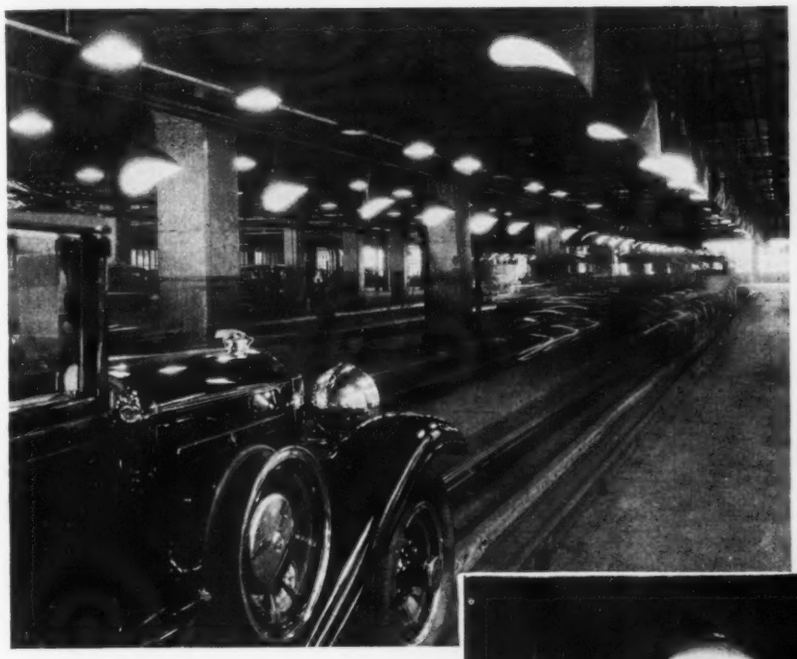
Wood Mill—The hazard of high-speed saws, shapers and formers makes it imperative that good lighting be

Production machinery requires adequate illumination

In the crankcase department ample floor space is allowed for machines. Cases move down the line to the hones, millers, multiple drills and then to the end of the line for final inspection. General illumination of high intensity is provided with mercury-vapor lamps spaced on 10x10-ft. centers. These lamps are mounted 9 ft. above the floor. At this height distribution is exceptionally good, shadows being virtually eliminated. Of course, individual motor drive adds to the efficiency of the illumination. This system is followed in various other departments, such as the machine shop, cylinder head, crankshaft, camshaft, gear blank, ring gear, screw machine, and motor test departments. The lighting load factor in these departments during the day is high, due to their locations, and a constant demand for uniform non-varying intensity. Intensity average, 28.9 foot-candles.

Creation of Light

By THOMAS G. WARD
Industrial Lighting Engineer
Detroit Edison Company,
Detroit, Mich.



Finish line needs lots of light—and gets it

The building of bodies requires special illumination. The various operations must be performed while the body is in motion on the conveyor and each operation must be completed before the body reaches a designated spot. High intensities are provided on all surfaces. General lighting is supplemented by vertical illumination from each side of the line. Many types of reflectors are used for fine illumination, namely, RLM "Glasssteel" diffuser, Benjamin 5613, mercury-vapor, vapor-proof angle, elliptical angle and "Isolux" angle.

The exterior finish line lighting equipment used consists of 300-watt "Glasssteel" units mounted 7 ft. above the floor, spaced 2½ ft. apart alternately on opposite sides of the track, giving an effective spacing of 5 ft. The same spacing is followed overhead; additional light is provided on the side panels by floor banks of 24 40-watt lamps in each bank. The intensities range from 42.5 foot-candles on the horizontal plane to a minimum of 18 foot-candles on the vertical, while the maximum vertical where lighting banks are used is 24.3 foot-candles.

supplied. The average lighting in the mill is 20.2 foot-candles.

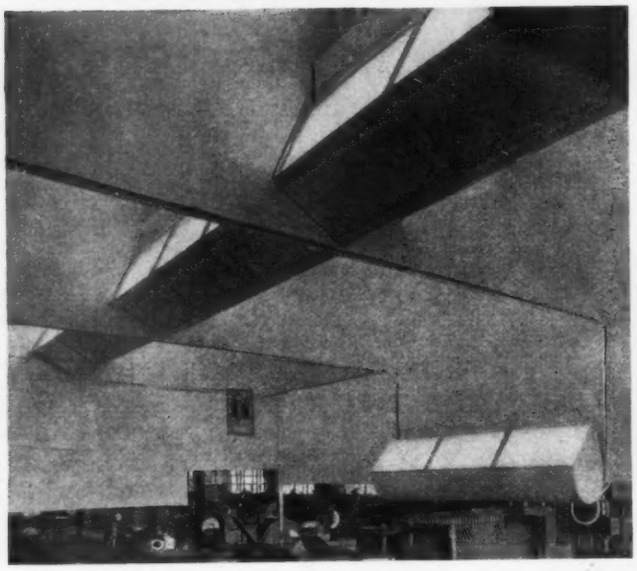
Metal Department — General illumination is used in the various operations with the exception of the large presses, where auxiliary elliptical angle reflectors are provided. These are mounted 3 ft. out from the press, on each side, both front and rear, and 7 ft. above the floor; 300-watt lamps concentrate the light upon the die, thus eliminating shadows. Intensities average 12 foot-candles at the die and 18.6 in the open area.

Motor and Chassis Assembly Departments—Standards of illumination at present for the various departments are fixed. Standard lighting for general purposes is 300-watt white bowl "Mazda" lamps equipped with RLM reflectors spaced 8x10 ft. and mounted at optional heights, from 9½ to 12 ft. above the floor. All circuits are wired for excess capacity; 500-watt lamps can be used if so desired. Mercury-vapor standard is 450-watt lamps on 10x10-ft. centers 9 ft. above the floor for general lighting and 7 ft. when installed along the conveyor lines. Intensity average, 25.6 foot-candles.

Spray Booths—Bodies are sprayed in either a box type or conveyor type booth; lighting is provided from the outside through wired glass windows, and angle reflectors direct the light toward each side of the body. Intensities average 8 foot-candles on the vertical.

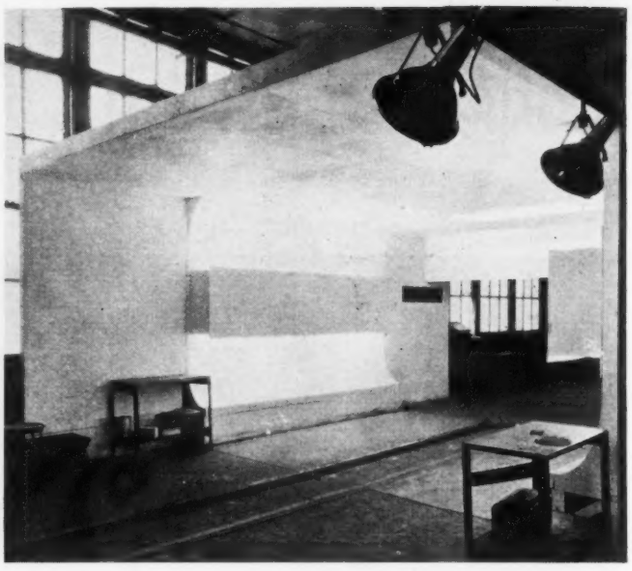
Summary of Lighting Data

Area of plant, sq.ft.	3,275,369
Area lighted with "Mazda" lamps, sq.ft.	2,802,892
Area lighted with mercury vapor lamps, sq.ft.	472,477
Number of mercury-vapor lamps	2,838
Number of "Mazda" lamps	25,002
Total kilowatts of mercury vapor lighting	1,459
Total kilowatts of "Mazda" lighting	5,958
Total kilowatts of lighting	7,417
Average watts per square foot of mercury-vapor lamps	3.08
Average watts per square foot of "Mazda" lamps	2.13



Inspecting chromium-plated small parts

Inspecting small hardware, particularly on a moving conveyor, is an operation that requires instant discrimination. Confusing high lights from any source cause specular reflections, thereby interfering with the inspector's ability to distinguish flaws and off-color spots. A specially designed metal booth 15x15 ft. covers the inspection end of the conveyor. Indirect lighting is provided by a box trough 15 ft. long, the upper windows of which are opal glass; this is supplemented by two sidewall units 5 ft. in length. Daylight lamps are used. Intensities average 10 foot-candles.



This is a ding booth

A booth 12x9 ft. was designed for this particular job of hunting for small dents and scratches on finished bodies. The lighting scheme installed utilizes a mixture of "Mazda" and mercury-vapor lamps; 40 100-watt "Mazda" and four mercury-vapor lamps are used on each side back of the shield; the light from the upper two units are directed to the ceiling cove, while the lower combination is directed to the bottom. The ceiling pocket has one mercury-vapor and ten 100-watt "Mazda" lamps; this light is directed toward the skirt in the rear to provide light for the back of the bodies. Indirect lighting is thus provided. This is the most significant lighting installation for body work of recent years; vertical intensities, as shown in the following, are probably the highest yet produced for this work: Vertical side 30 in. above floor, 139.6 foot-candles average. Vertical side 54 in. above floor, 91.1 foot-candles average. Vertical rear 36 in. above floor, 33.8 foot-candles average. Stations 3 ft. from side walls at body panels.

Foundry—Lighting in the iron foundry, aluminum, chipping and cleaning departments and in the core room consists of 300-watt lamps mounted 10 ft. above the floor, spaced on 8x10-ft. centers, equipped with RLM dome reflectors. This system provides a uniform intensity of 21.7 foot-candles over the working area. Intensities are higher over the aluminum mold conveyors, over which lamps are spaced 8x6 ft. to compensate for the interference of the structural steel framework. Intensities here have an average of 22 foot-candles.

Die Shop — Operations in the die shop are practically continuous; all work is of a highly detailed nature. Individual benches are provided for each operator; these are arranged in line. General illumination of fairly high intensity is furnished and each operator has an individual lamp of the flexible arm type that can be set at any angle or distance desired. This is an economical as well as a practical arrangement. Vertical and horizontal illumination, as well as spot lighting of deep dies, is essential to this operation. Average foot-candles is 19.8.

Still under good light the finished car stands ready for delivery

Commissioner Declares

Reproduction Cost Still Determines Fair Value

By HAROLD E. WEST
Chairman Maryland Public Service Commission

I HAVE read with a great deal of interest the article by Page Golson, vice-president of Ford, Bacon & Davis, Inc., which appeared in the ELECTRICAL WORLD (August 1, page 213) and upon which you ask me to make comment.

I disagree most emphatically with the viewpoint expressed by Mr. Golson. He argues that now, because commodity prices are declining, the reproduction cost theory of finding the fair value of the property of utilities should be abandoned and that historical cost should be adopted by commissions in fixing the rate base. He makes several naive statements. Some of these are as follows:

> The question of a reasonable commission case rate clearly is and has always been a matter of fairness and equity.
>
> Reproduction may eventually be lower than historical cost, and whenever that is the case the fair and equitable rate base will take the view that historical cost is the lower limit.
>
> Certainly the owners of a utility are entitled to earn at least a fair return upon investment made in good faith.
>
> It would appear, therefore, that the presentation of valuations for rate cases should continue as formerly, but it should be definitely recognized that where reproduction valuations are less than historical cost valuations, the rate base should not be less than the historical cost.

These quotations from Mr. Golson's article show that he is singing the valuation song in an entirely different key from that used by him in recent years. I have sat in several cases in which appraisals made by Ford, Bacon & Davis were submitted by utilities as the basis for the establishment of bases for the determination of rates. These appraisals of utility properties were invariably based by Ford, Bacon & Davis engineers upon reproduction cost new less depreciation, and we have found their estimates of reproduction cost new to be considerably higher than our commission's engineers considered reasonable. In adopting the reproduction cost new theory the utilities were of course entirely within their rights. That theory was sanctioned by the United States Supreme Court in a long line of decisions, each one strengthening the reproduction cost theory, until in the Indianapolis Water Company case and the United Railways case the court made it the dominant element in finding fair value.

Now, certainly, the utilities cannot eat their cake and have it too. In the period of higher prices they insisted on reproduction cost because that was higher than investment and enabled them to cash in on a lot of unearned increment in the value of their properties. In that period we heard nothing from their experts and attorneys of Mr. Golson's theory that "the question of reasonable commission case rate base clearly is and always has been a matter of fairness and equity," or "the owners of a utility are entitled to earn at least a fair return upon investment made in good faith." So far as they were concerned the return upon *investment* was not to be thought of. Their idea of fairness and equity was reproduction cost. What they sought and what they got was a return on fair value, and this fair value was determined largely, if not entirely, upon reproduction cost.

The public paid the bill on these valuations which were largely in excess of investment or historical cost. There was nothing that could be done about it, although the protest was loud and long. The Supreme Court decisions tied the hands of the commissions and prevented them from basing valuations on investment or historical cost. I do not recall a case in which attorneys for utilities did not emphasize the attitude of the Supreme Court on the reproduction cost theory. Now, perhaps, in valuation cases we shall see emphasis put upon a different method of finding fair value.

The last of the propositions which I have quoted from Mr. Golson's article—"it should be definitely recognized that where reproduction valuations are less than his-

torical cost valuations the rate base should not be less than the historical cost"—is very amusing. I think Mr. Golson must be spoofing. In other words, his proposition is that where valuation based upon reproduction cost is higher, commissions should accept reproduction cost, but where investment cost is higher, commissions should accept investment cost, or, heads I win and tails you lose. So far as the Public Service Commission of Maryland is concerned it will never accept any such doctrine. We will follow in the future, as we have always tried to do in the past, the law as laid down by the Supreme Court. We shall not attempt to change the Supreme Court's rulings which, in effect, have made reproduction cost the dominant element in finding fair value, in order to let the utilities under our jurisdiction earn returns on the highest rate base possible.

If commodity prices decline materially within the next few years and utilities are faced with reductions in their rate bases because of the following by commissions of the reproduction cost theory, they will be but reaping the harvest which they themselves have sown. No well-managed and conservatively financed operating company has anything serious to fear as a result of such a situation. It may, however, result in a very serious embarrassment to a lot of holding companies whose agents scurried around the country in the last dozen years and bought up operating companies at ridiculously high prices, then insisted on valuations based on the very highest figure for reproduction cost they could get, so as to have the valuation approximate as closely as possible the absurd prices they paid for those properties, and who now may find that they cannot secure a return on money which they have paid out.

On several occasions the Maryland Public Service Commission has pointed out the danger of such activities, and if disaster comes as a result of lowering commodity prices and an insistence in years gone by upon valuations based on reproduction cost, then, it seems to me, such companies will have to face the issue and take their medicine. Certainly the Maryland commission will not increase valuations of operating companies so that holding companies which own them may meet their interest payments and other charges.

Handles Customer's Calls Quickly and Economically

By H. W. READ

System Analyst Remington Rand Business Service

To meet the growing demand for instant, or even more previous, service to customers on requests for information in matters of connect and disconnect orders, service conditions, appliance repairs and the like is the earnest desire of every electric utility. But how to do it without excessive increase of expense is the problem. The solution found by the Dayton Power & Light Company, Dayton, Ohio, was the formation of a centralized information bureau. Instead of service inquiries and trouble reports going to one or more of several different departments, the centralized service file brought to one point all service information; all calls now go to that one point. The company modernized and speeded up every step of the new system to a point where the worried consumer now gets prompt and intelligent answers.

The problem

Under the old plan a call must first be referred to the proper one of four departments. Calls were frequently referred to the wrong department. Even when the call went to the right department, it was often necessary to confer with another to secure complete information. Each department maintained its own records, which, of course, duplicated those maintained by other departments, at least in the details of location data, etc. The orders were slow in being recorded on the cards, and it was impossible properly to signal the salient facts which might indicate the correct answer to an inquiry. Installation, reconnect and disconnect orders were slow in being transmitted. All orders were first checked with order files and were correspondingly slow in being issued.

How could the utmost speed be obtained in making the necessary record references and answering calls, as well as in entering and transmitting orders? For every meter installed, a service record card is made out and filed visibly by service location. This location record is then maintained permanently at this place in the file. It shows customer's name, address, route and folio, earning account, apartment number, meter number, size, location and date meter was installed. Space is provided for noting date of service calls and investigations and results of service men's or investigator's reports. Every service call must be referred to this record, both to guard against incorrect infor-

Customer calls for information go to the central bureau

Calls go to locations of data in the visible record files. Phone jacks on top of files enable the operator to pick up a call within 3 ft. of the record card.

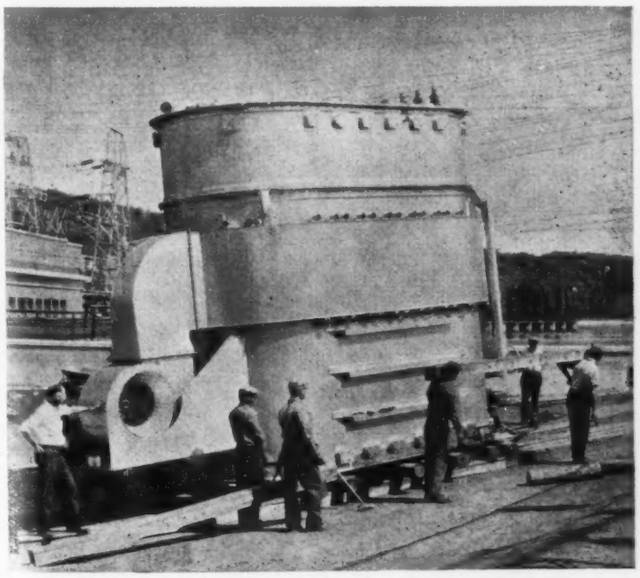
mation and unwarranted promises, and to ascertain the responsibility of the party making the call, and every service order resulting from these calls originates at this central file.

It is still necessary to maintain contact with the public at a commercial counter at a distance from the information bureau. There the applications for new installations, disconnects, reconnects, transfers, etc., are made. There contact with the credit department is maintained. The moment the proper credit O.K. is received, these applications are electrically transmitted to the information bureau, and an order written in manifold.

A service inquiry or a trouble call goes directly to the central information bureau. An eight-position telephone board obviates delay in taking the call, which is immediately referred to the proper one of the phone jacks spaced at 6-ft. intervals along the top of the information file, which is of the visible, permanent card type. The file operator glances at the service record card and gives the consumer a correct reply to his inquiry. Ten customer situations may be signaled on the visible margins of the record cards—disconnects, reconnects, transfers, non-pay disconnects, orders held up, temporary disconnects, disconnects for fire or explosion, disconnects for interference and meters removed. Various colors and sizes of signals are used. They are simply slipped under the protected margin and cannot shift. A marginal scale, 1 to 31, indicates the day orders are to be executed. With this amount of information visible at a glance, it is estimated that trouble calls are handled more than twice as fast as previously and with a far greater degree of accuracy.

The plan is interlocked with other operating and record requirements. If the call is a disconnect order, for instance, the operator refers to the card in the file, checking name, address, date wanted, location of key and mailing address for final bill, and at the same time fills out a disconnect order form and places a tan colored signal on the card in the file. This disconnect order is then electrically transcribed and transmitted to the proper department. The plan has been in successful operation for more than two years and the management feels that the installation has materially improved the service to consumers as well as shortened the routine within the office.

Moving a 32,500-Kva. Auto-Transformer Into Place



at Cabot Station, Turners Falls Power & Electric Company

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Photo-Electric Relay Used to Test Watt-Hour Meters

By Prof. CHARLES A. PERKINS
University of Tennessee, Knoxville

The ELECTRICAL WORLD for August 15 describes a method for comparing a rotating standard meter directly with the second pendulum of a clock, by means of the General Electric photo-electric relay, as used by the Public Service Company of Colorado.

I have been using the same type of relay in my laboratory for adjusting a working standard to the rotating standard and also for comparing house meters with the working standard.

For this purpose a 250-watt lamp is supported 2 or 3 ft. above the working standard and a part of the filament is focussed by a lens onto a hole in the rotating disk. The hole is about $\frac{1}{8}$ in. in diameter (some types of meters have such a hole, others must have a hole made for the purpose). When in line with the light the hole is between the magnet and the back of the meter. The photo-electric tube is placed below the disk to catch the light as it comes through the hole.

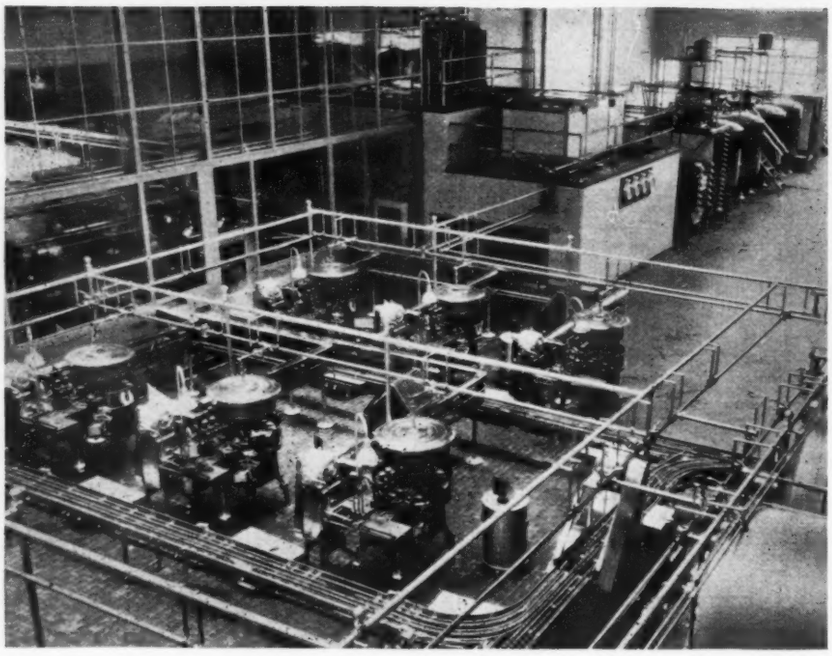
Now if the meter is started, a click of the relay is heard at each revolution of the disk. By looking intently at the pointer of the rotating standard its position at successive clicks can be seen to advance or retreat, unless the two meters are in close synchronism. Three or four revolutions of the disk are sufficient for timing the meter within less than 1 per cent. As adjustments of the meter can be made without interrupting the test, they are made rapidly and accurately for as many different loads as may be desired.

Any ordinary house meter may now be compared with the working standard, if its normal speed is the same or a multiple of the same as that of the standard. This is done by connecting the house meter in place of the rotating standard and noticing whether the black mark on the disk advances or retreats as the successive clicks are heard. This is not quite as accurate as the comparison with the rotating standard, because the position of the black spot is not so easy to locate as that of the pointer, yet it requires but a few revolutions to determine the adjustment to any desired accuracy.

Since the clicks of the first magnet of the photo-electric relay are loud enough to be heard easily, the second magnet is disconnected.

More complicated methods were tried, such as the use of a neon lamp which was lighted at each closing of the relay by the discharge of a condenser through the lamp. But the light of the lamp was not bright and the method did not prove as satisfactory as the simpler one described above.

Electricity Supply in a Modern



By PAUL E. PATRICK
Chief Electrician
Bowman Dairy Company, Chicago, Ill.

Fifty motors in the main room

Tank agitators, pumps, pasteurizers, bottling and capping machines and conveyors, all these have individual motor drives. Through the glass partition may be seen the two bottle washers.

EASE and low cost of maintenance and convenience of operation were the principal objectives of the electrical design in the new milk-processing plant of the Bowman Dairy Company at River Forest, a western suburb of Chicago. To these objectives every detail of distribution was planned and every type of apparatus specified. Dairy service is very hard on electrical devices and wiring. Every day when the equipment is being sterilized the surplus steam nearly fills the rooms. This condenses inside of conduits, motors, motor-starting switches and, in fact, everywhere. We have found that moisture will get inside of even totally inclosed motors. So we have made it impossible for it to collect enough to do any damage by drilling a small hole in the bottoms of the frames. In this plant every conduit is pitched to drain, the draining point being a fitting or box with a hole drilled at its lowest point. The pitch is not enough to affect the appearance of the job, but is enough to prevent water collecting.

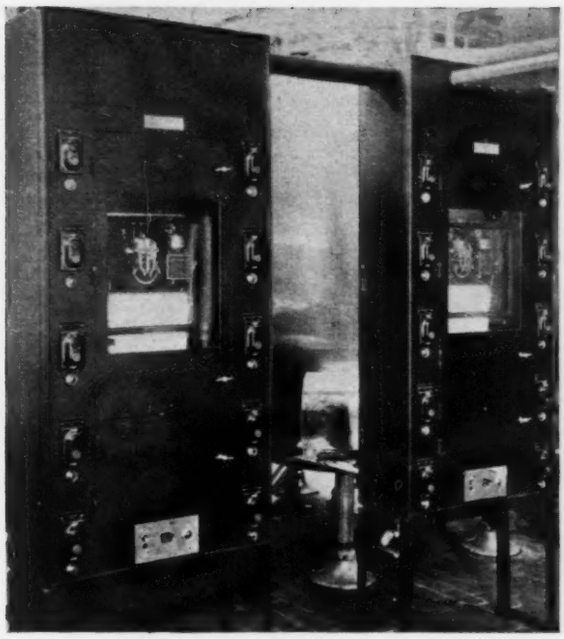
The largest item of electrical maintenance in a dairy is motor starters. To reduce this item the starters are concentrated in groups in wall panels removed from the dairy machines. We have developed for this plant a new type of combined fuse panel and starter cabinet, shown in an accompanying illustration. There are thirteen of these, eleven being sixteen-circuit and two eight-circuit. There is also an ordinary fused panel for a group of motors above 10 hp. The starters are all Trumbull No. 81,321 magnetic, with self-resetting relays, the same size starter being used on all motors up to 10 hp. This works out quite nicely in our plants as about 95 per cent of our motors are 10 hp. and under. A starter with self-resetting relays we think is far superior for this type of combination panel to the hand reset type. Twelve of these cabinets are set in the walls, extending all the way through, with doors front and rear. This makes the wiring and maintenance very easy indeed. The starters are located reasonably close to the motors they control, yet in a location where they are not subjected to excessive moisture.

Advantages of this type of power distribution and motor control are many. The cost is no more than the common system of using fuse panels and putting the motor-starting switches at or near the motors; it is often difficult to find a location near the motor or machine for the switch, where it will be convenient to the operator, but usually easy to find room for a push button; large numbers of cabinets and motor-starting switches located around the plant represent quite a maintenance problem, as they are subject to rust, corrosion and mechanical injury, and when good appearance counts for as much as it does in a milk plant, they are very objectionable. Besides, the magnetics have the great advantages of making it easy to arrange to control motors from several locations and several motors can be started in the proper sequence.

For instance, on our ice crusher and the conveyor for the crushed ice the wiring is arranged so that the crusher cannot be started until the conveyor is started, and in stopping the order is reversed. This prevents clogging the conveyor. Also at several places in the plant one man has from three to ten motors under his control. For locations such as these, ten push buttons take up no more room than would be required for one hand-starting switch. For convenience of operation there is no comparison. The buttons used are the "Monitor" No. 9060 and the Rees all-bakelite button. The "Monitor" is almost watertight, small, rugged and should last indefinitely. The adaptability of the Rees

Milk Plant

- No hand motor starters hung on machines
- Central distribution to related motor groups
- Control panels accessible, front and back
- Effect of humidity on electrical equipment much reduced



Pasteurizer control is automatic

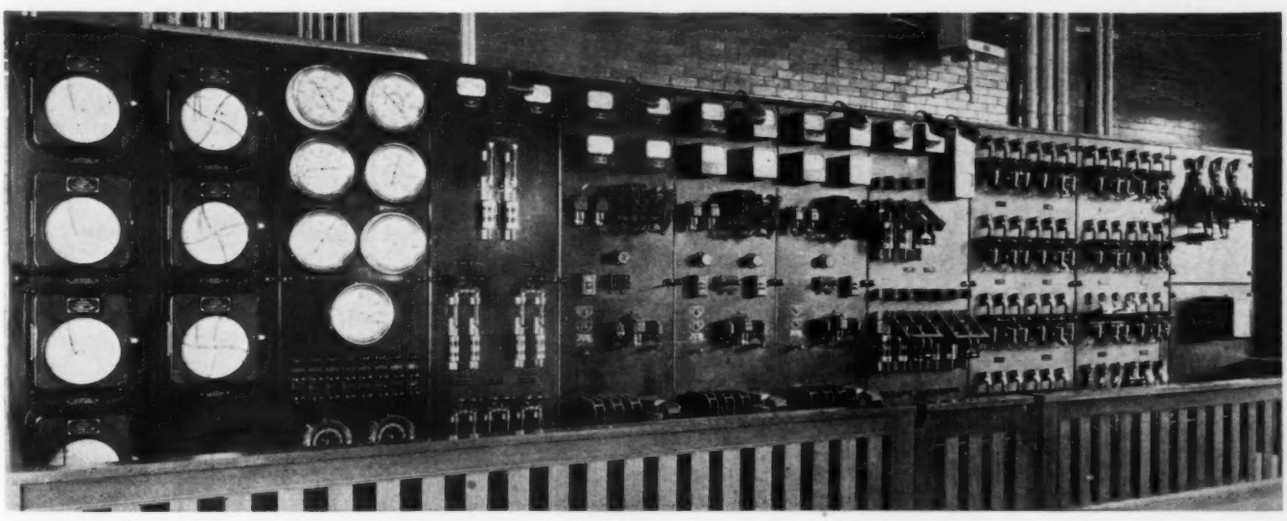
A drop of one-half degree in the temperature of the milk from the pasteurizer will stop the output flow by means of the potentiometer type recording thermometer.

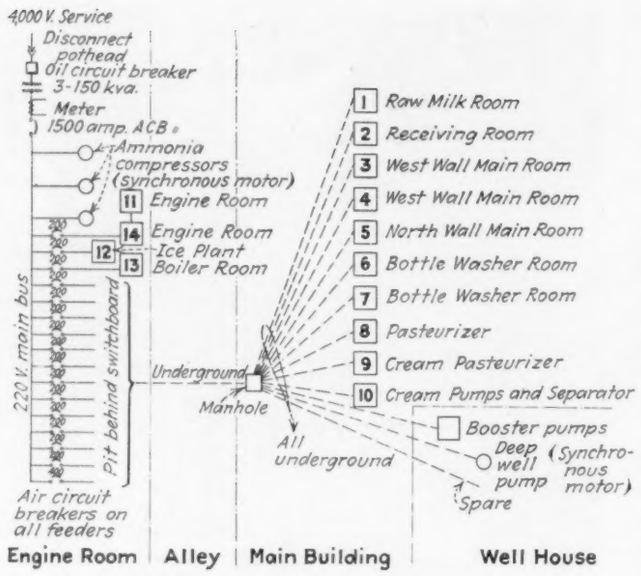
button to mounting on the front of cabinets and its appearance are points in its favor. One other good feature is that it involves the use of standard conduit fittings.

An interesting and, we think, very valuable addition to our milk-pasteurizing systems is a device which makes it practically impossible for any milk to get through the pasteurizer which hasn't been brought up to the proper temperature. Temperature control devices such as the ones in use in this plant are almost 100 per cent efficient. They will hold the milk temperature at the outlet of the pasteurizer at 144 deg. F. plus or minus one-quarter of one degree continually. However, there are things which could happen, such as lowered steam pressure, failure of a motor or pump on the heating water circulating system, or the failure of a controller, any one of which would cause a lowered milk temperature. The common practice has been for operators to be on duty at all times at or near the recording thermometers and keep close watch on the temperatures. We developed in our own electrical department, after a long series of experiments, a device that removes the human element entirely. This device uses a Leeds & Northrup resistance thermometer potentiometer recorder and controller, in connection with a series of relays, and will automatically stop the flow of milk should the temperature at the outlet of the pasteurizer drop one-half of one degree. It will remain stopped until the correct temperature is restored, then go on, whether the operator is there or not. A horn signal notifies the operator that the pump has stopped, also a red lamp flashes. A green lamp indicates normal operation.

The main switchboard

Fuses are used only on lighting circuits. Sixteen air breakers on the two panels at the right control the power circuits. There is no possibility of any power line operating with an open phase.





The distribution scheme

Feeders come underground across the alley from the main switchboard in the engine room to a manhole in the main building, where they spread and from there run, without splices, and still underground, to the combined starter and distribution panels. Panel numbers refer to groupings of motor tabulation.

Pasteurizer pumps are started at the beginning of the run with the usual push buttons. As soon as milk at the proper temperature reaches the resistance thermometer bulb at the pasteurizer outlet the controlling device cuts in automatically and controls the operation for the entire run. Only by a simultaneous failure of the temperature control and the automatic stop control could any milk get through not properly heated, and the operator is right there to prevent even that. This constitutes nearly perfect operation of a milk pasteurizer.

Deep well water supply

The water supply for a plant of this kind and size is very important, as the requirements are about 200,000 gal. per day. We feared that the city water supply of the village of River Forest was hardly adequate to guarantee this amount during the summer months, so a deep well was drilled. It is a 12-in. hole, 2,606 ft. deep, and has a minimum capacity of 350 g.p.m. The pump is a Lane & Bowler turbine placed down 400 ft. from the surface.

It is driven by a 75-hp. Ideal vertical synchronous motor at 1,200 r.p.m., this motor requiring special protection control. When the motor is stopped the water in the line runs back to the normal level of about 200 ft., and while running back it runs the pump and motor in the reverse direction for two or three minutes.

The motor is prevented from starting again while it is spinning backward by a G.E.-MC11 relay, which cuts in when the motor stops. This protection is very important as the inertia of the pump propellers and the 440 ft. of shaft is so great that should the motor start while it is spinning backward this shaft would probably shear off. A further protection is a G.E. reverse phase relay, to prevent any possible chance of the motor ever being started in the wrong direction and unscrewing the shaft sections. This pump discharges into a reservoir and three $7\frac{1}{2}$-hp. centrifugal pumps boost the water up to the tank in the tower of the main building.

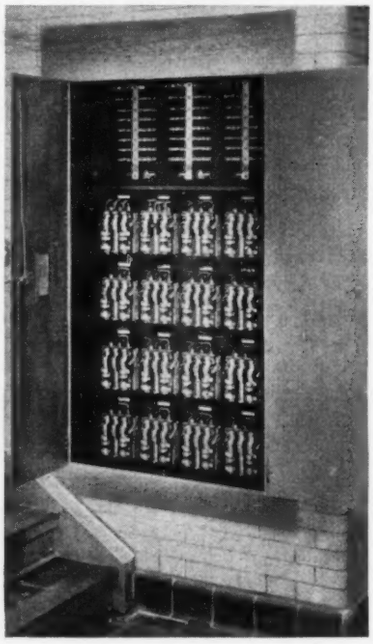
All the motors are controlled by float switches, making the water supply system entirely automatic. The well is cased down about 1,500 ft., effectively sealing off any surface water. Connection is also made to the city water mains for use in emergencies.

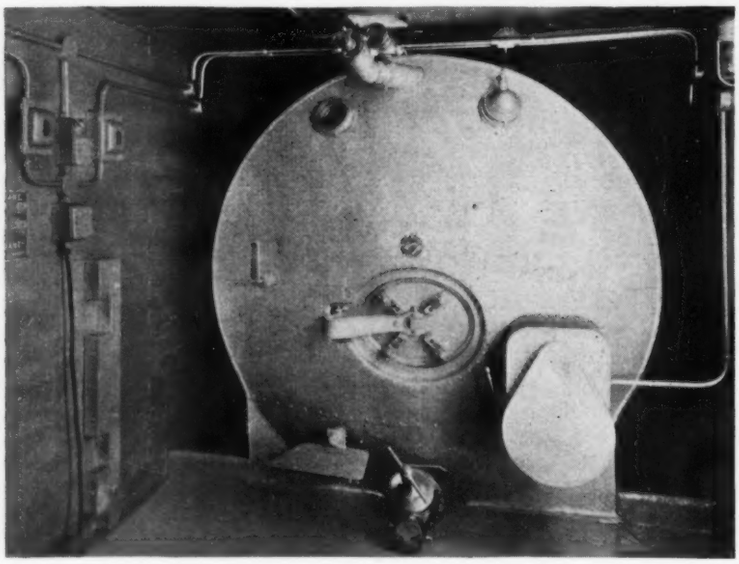
Lighting carefully designed

Lighting in all of the rooms in the building except the main work room is taken care of in the usual way, using "Glassteel" diffusers, RLM reflectors or in-

Motor starters grouped

The box is set in the wall with doors on both sides, making the back of the panel easily accessible from the other side of the wall. Conduits can be extended from either face. In this case conduits go out the back.



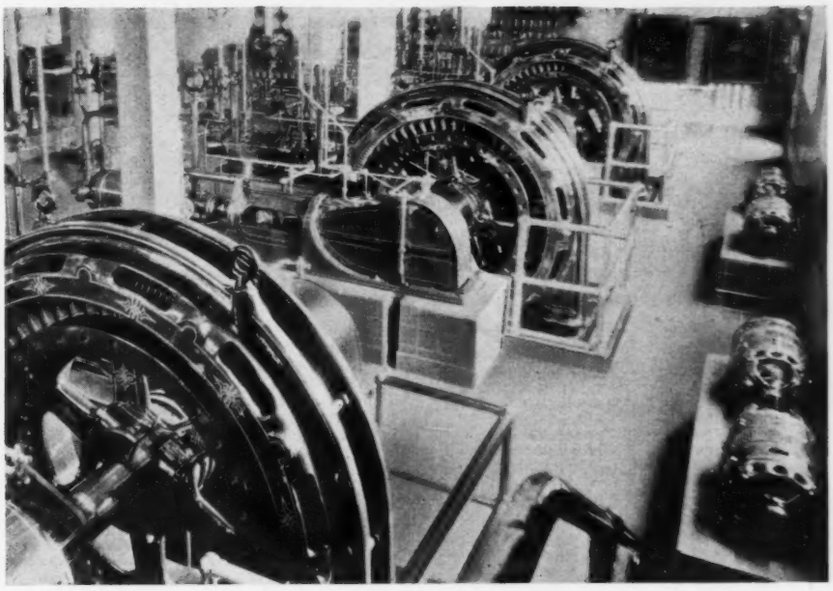


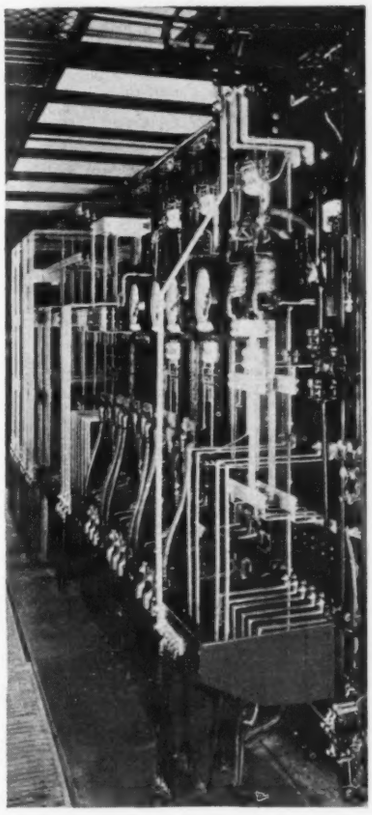
Milk transported in electrified tank cars

Car contains two 25,000-lb. capacity tanks each equipped with motor-driven agitator to recombine separated cream before unloading. Through pipe and electrical connections the tank cars become integral parts of the milk-processing plant.

Synchronous compressor drives

The ammonia compressors for the cooling system are driven by Ideal 125-hp., 138-r.p.m., 220-volt synchronous motors, controlled by Ideal automatic starters which are built into the main switchboard. The motors are separately excited, with one spare exciter that may be connected to any one of the three.





Aluminum busbars withstand ammonia corrosion

The main switchboard is located in the compressor room, where ammonia fumes would corrode copper very quickly. Hence, aluminum buses are used. In the floor may be seen the gratings over the pit from which feeders go underground to distribution panels.

closing globes, as needed. The main work room of the plant is 142 ft. long, 60 ft. wide and has a 24-ft. ceiling. The walls in this room, as well as in all the rooms in the main building except the store room, are white glazed brick. This main room is lighted to 9-foot-candles intensity by 42 300-watt high bay units of the prismatic reflector type shining down through round windows or lenses in the ceiling 20 in. in diameter. These lenses are made in sections, leaded together, and are of a clear pebbled glass which breaks up the glare, but absorbs very little light. The reflector units are hung in the loft and are easily accessible for cleaning and relamping.

Balcony lighting is similar except that the reflectors are of the mirror type, 150 watt, and the lenses are 10 in. in diameter. The lighting in these two sections of the building gives a true sunlight effect, very much like the natural light coming in through the skylights in the daytime. The visitors' room, which is 36 x 40 ft., is lighted by five 200-watt indirect wall urns and several table and floor lamps. The office, about the same size, has nine 200-watt wall urns, the same type as the visitors' room. The south front of the building, four sides of the tower and two sides of the stack are floodlighted with Crouse-Hinds 500-watt floodlights. These are controlled by a G.E. 5-amp. Telechron time switch operating the pilot circuit of a 60-amp. contactor. The connected lighting load of the entire plant is 62 kw.

The connected motor load of the entire plant consists of 168 motors aggregating 926 hp. The probable maximum demand will be about 400 kw. on the power and 55 kw. on the light. We expect to earn a rate of about 1.6 cents per kilowatt-hour. Owning our own transformers and primary metering were both considered and decided against. Three-phase service at 4,000 volts, purchased from the Public Service Company of Northern Illinois, is brought up from underground lines to the transformer room on the second floor of this building. The transformers are three 150 kva. on the power and one 75 kva. on the light. The power company meters for secondary metering are also located in this room. Three 3½-in. conduits carry three sets of three 700,000-circ.mil cables, transmitting the power at 220 volts to the switchboard on the ground floor. The main switch is a 1,500-amp. I.T.E. air breaker. From here the buses feed fourteen 200-amp. and two 400-amp. breakers, which in turn feed the power panels scattered throughout the plant. We think that circuit breakers are very much superior to fuses for this purpose inasmuch as there can be no chance of a feeder circuit single-phasing.

The instruments on the board are the usual line voltmeter, three-phase, three-unit ammeter and power-factor meter on the incoming lines and a similar set on each of the three synchronous motors. There is also an Esterline-Angus recording wattmeter to record the power demand. All of the busbars on the back of the board are aluminum. The reason for using this instead of copper was that it will corrode less from the ammonia fumes, which at times get pretty strong in this room. Back of the switchboard there is a concrete pit 5 ft. wide, 3½ ft. deep and 25 ft. long, full length of the board. Half of it next to the board is covered with ebony asbestos panels with holes drilled for the feeder circuit cables, the other half by removable wood grillwork. From this pit 2½-in. conduits extend underground to a manhole in the main building and from here also underground to the various power panels. These conduits are all pitched to drain to the manhole, which has a drain pipe in it. All of the cables are No. 0000 single conductor, 30 per cent rubber, lead-covered.

Motor Drives in Bowman Milk Company's River Forest Plant

Panels Nos. 1 to 13 inclusive are magnetic starters, push-button motor control.
Panel No. 14 has fuses with starters at motors. All motors are squirrel-cage except those indicated.

CW.—Crocker-Wheeler
GE —General Electric
L —Lincoln
W —Westinghouse
C —Century
K —King
E —Emerson
HC—Holtzer-Cabot
Le —Leland
B —Bodine
A —American
ECOA—Elevator Co. of America
I —Ideal
H —Howell
P —Peerless

No. of Motors	Sizes, Hp.	Speed, R.P.M.	Maker	Device Driven
		Panel No. 1		
6	3	1,200	CW	Raw milk storage tank agitators.
6	18			
		Panel No. 2		
1	2	1,800	GE	Blower.
2	3	1,800	CW	Milk pumps.
1	1½	1,800	L	Can washer conveyor.
1	1½	3,600	CW.	Can washer drier.
1	1/20	1,800	W	Shaker, laboratory.
2	1/3	1,800	C	Testers, laboratory.
1	1/3	1,200	K	Exhaust fan.
1	1	1,800	CW	Can washer.
2	7½	1,800	CW	Can washer pump.
12	28 1/3			
		Panel No. 3		
1	½	1,200	K	Exhaust fan.
1	½	1,200	E	Unit heater.
1	1	1,800	CW	Can washer.
1	1½	3,600	CW	Can washer drier.
1	1½	1,800	L	Car washer conveyor.
1	2	1,800	CW	Can washer conveyor.
2	3	1,800	GE	Cooling water pump.
6	3	1,200	CW	Storage tank agitators.
14	31			
		Panel No. 4		
1	7½	900	CW	Cooler ventilating fan.
7	3	900	CW	Cooler conveyors.
2	¾	900	GE	Window opener.
1	¾	1,800	GE	Window opener.
11	30½			
		Panel No. 5		
7	⅜	1,200	HC	Bottle fillers.
7	3½			
		Panel No. 6		
2	5	1,800	CW	Case washer pumps.
1	5	900	CW	Case conveyor.
7	3	900	CW	Case conveyor.
2	3	1,200	CW	Bottle washers.
3	3	1,800	CW	Bottle washer pumps.
1	3	1,800	CW	Can conveyor.
2	2	3,600	CW	Condensate pump.
1	¼	1,800	Le	Pasteurizer air compressor.
1	3/4	1,800	CW	Grading pump.
1	1 3/4	1,800	CW	Intermediate tank agitator.
21	60½			
		Panel No. 7		
12	1½	900	CW	Bottle conveyors.
1	1½	1,200	CW	Raw milk pump.
13	19½			
		Panel No. 8		
4	5	1,800	CW	Pasteurizer heater pumps
2	2	1,800	CW	Pasteurizer pumps.
2	2	1,800	CW	Pasteurizer holder pumps
2	1/20	1,800	B	Pasteurizer holder timers.
1	1/3	1,200	K	Locker room exhaust fans
8	1/3	1,800	CW	Pasteurizer holder agitators.
2	1	1,200	CW	Pasteurizer transfers.
21	33 5/10			
		Panel No. 9		
1	1/3	1,800	C	Tester, laboratory
1	1/3	900	CW	Separator cream pump
2	2	900	CW	Cream pumps.
1	3	1,800	A	Skim milk pump.
1	3	1,800	CW	Cooling water pump
6	11 1/12			
		Panel No. 10		
1	3	1,800	CW	Cooling water pump.
2	5	1,800	GE	Cream pasteurizer heater pumps.
1	5	1,800	CW	Separator.
1	2	900	CW	Cream pasteurizer pump
1	2	1,200	GE	Foam eliminator.
2	3	1,800	CW	Separator hot water pumps.
4	2	1,200	CW	Jensen vat agitators.
12	36			
		Panel No. 11		
3	7½	1,800	CW	Cooling water pumps.
1	7½	1,000	ECOA	Elevator.
3	10	1,800	I	Spray tower pumps.
4	7½	1,800	I	Exciters for synchronous motors..
1	5	1,200	H	Cooling water agitators
12	95			
		Panel No. 12		
1	5	1,800	CW	Brine pump.
1	5	900	CW	Ice crusher.
1	5	1,200	CW	Ice elevator.
1	10	600–1,800	CW	Oil burner blower.
1	3	900	C	Brine agitator.
1	2.1	1,530	CW	Ice hoist.
1	2	1,200	CW	Ice conveyor.
1	¼	1,800	C	Cooling water recirculator.
8	32½			
		Panel No. 13		
1	½	1,200	P	Boiler room oil pump.
2	5	3,600	W	Oil burners.
3	10½			
		Panel No. 14 (fused)		
1	15	1,200	I	Blower.
1	25	600	I	Air compressor.
2	40			
		From Main Switchboard		
3	125	138*	I	Ammonia compressors.
3	375			
		Well House Switchboard		
3	7½	1,800	CW	Booster pumps.
1	75	1,200*	I	Deep well pump.
4	97½			
Grand total		155 units.		921 3/10 hp.

* (Synch.).

The Bowman Dairy Company handles its own engineering in all branches except architectural. In the electrical branch of that department we handle the construction work also. We maintain a crew of class A union electricians for all of our work, both construction and maintenance. We find that it pays, one very good reason being that these men are working on the same class of work all the time and are thoroughly acquainted with all the conditions and requirements. It is obvious, also, that men who install equipment are more capable of maintaining it afterward than any one else. Many new ideas particularly adapted to this industry have been developed, some of which have proved very valuable. We have also kept such close watch on our motor overload protection that our motor failures are now only about 10 per cent of what they were four or five years ago.

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Better Lighting for Older Eyes

By M. LUCKIESH

Director Lighting Research Laboratory, General Electric Company, Cleveland, Ohio

The eyes naturally developed to function for distant vision rather than for close vision. If a near object is to be seen clearly the eyes must be accurately focused upon it. The adaptability of the eyes for distant and near vision—the power of accommodation—steadily decreases with advancing age. The loss of accommodation—presbyopia—is largely attributed to a hardening of the crystalline lens of the eye. As age advances the nearest point at which the eyes can focus (near point) gradually recedes. For example, in reading the page must be held at correspondingly greater distances from the eyes as the power of accommodation diminishes. In order to obtain better seeing the eyes are sometimes brought as close to the work as accommodation permits, thus taxing the power of accommodation to the limit, which results in serious eye strain. The relationship between age and power of accommodation is as follows:

Age, Years	Near-Point, In.	Age, Years	Near-Point, In.
10	2.7	40	9
15	3.1	45	12
20	3.9	50	16
25	4.7	55	20
30	5.5	60	40
35	7.1	65	80

Since about one-third of the power of accommodation should be held in reserve to avoid undue strain, it will be noted that the "workable near point" has receded beyond the normal reading distance (14 in.) at the age of 45 years. As objects must be placed at greater distances from the eyes as the near point recedes, in order to be in focus, their visual size and, consequently, their visibility are correspondingly reduced. However, visibility may be definitely improved by increasing the level of illumination. The following table shows the distance

at which an object of a certain size is just visible for various levels of illumination:

Foot-Candles	Distance for Equal Visibility, In.	Foot-Candles	Distance for Equal Visibility, In.
1	14.0	20	20.8
2	15.3	50	23.2
5	17.5	100	25.4
10	19.1		

It is apparent that higher levels of illumination significantly reduce the handicap of presbyopia. Between the ages of 45 and 55 years the near point recedes about 8 in. The decreased visibility due to this recession may be approximately offset by increasing the level of illumination from 5 to 50 foot-candles, as is indicated by the second table. In other cases, improved lighting and correspondingly improved visibility would permit the eye muscles to function with less strain or contraction, thereby reducing ocular fatigue and the development of refractive errors.

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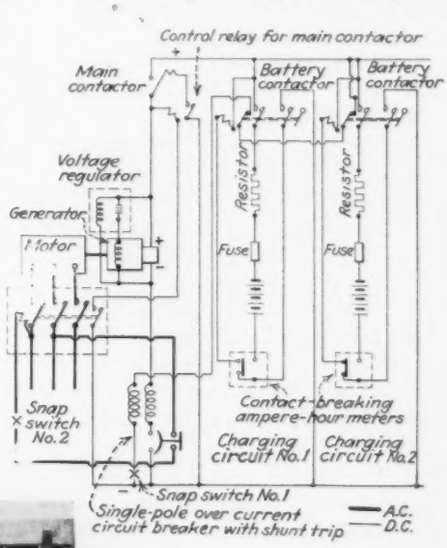
Automatic Charging Panel Improves Battery Service

This fifteen-circuit, automatic battery-charging control panel is utilized in connection with a 75-kw., 85/85-volt motor-generator set by a user of electric trucks whose demands for full automatic operation were especially exacting. The panel, designed by General Electric engineers, is representative of the trend toward automatic equipment.

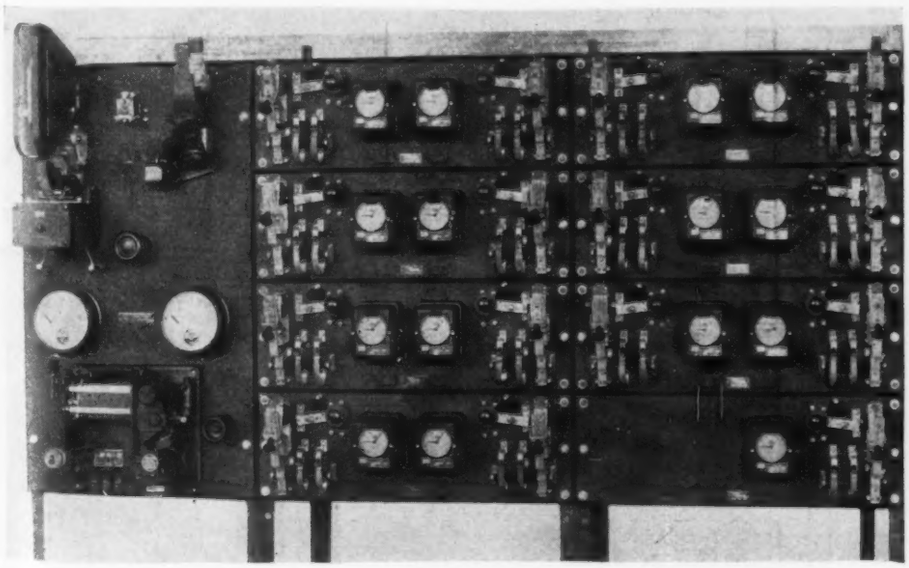
Features of this installation, which is based upon nightly charging of the batteries for each vehicle, include automatic charging by the modified constant potential method, automatic regulation of generator voltage within the limits of plus or minus 3 per cent, automatic cut-off of each battery upon termination of charging, automatic shutdown of motor-generator upon cut-off of last battery, automatic shutdown of motor-generator in the event of line failure, automatic restart of motor-generator upon resumption of power supply after an interruption.

Each battery is connected to an individual charging circuit and contact-breaking ampere-hour meters for each circuit are set to a figure equal to the ampere-hours discharged. The contacts are therefore in the closed position. Single-pole, over-current circuit breakers with shunt trip connect the negative of the generator to the negative bus. The snap switch (1) in the shunt trip circuit is opened. Snap switch (2) is then closed, its alternating-current circuit to the starter being completed through the auxiliary contacts of the circuit breaker. The motor-generator then starts, the generator voltage comes up to normal and is maintained within close limits by the voltage regulator. Direct-current generator voltage is now applied to the main contactor relay through a direct-current interlock in the motor starter. This relay is set to close on normal voltage and when closed energizes main contactor, thereby connecting the positive side of the generator to the positive bus.

Each battery is put on charge by closing individual battery contactors. After the first battery has been connected to the direct-current bus snap switch (1) is closed, preparatory to the final shutdown of the motor-generator set after the last battery has completed its charge. It should be noted that each battery contactor is held closed by current which flows through the contacts of its associated ampere-hour meter. When the charge is completed, this contact in the meter opens and the battery contactor then also opens. When the last battery circuit is thus opened a series circuit is completed which applies generator voltage to the shunt trip of the circuit breaker, which then opens, and in doing so opens the alternating-current control circuit of the motor starter, shutting down the motor-generator set.



Complete automatic control for charging vehicle batteries



In the event of alternating-current line failure during charge the motor starter drops out, opening the main contactor, since its relay is de-energized. The battery contactors remain closed. When the alternating-current line returns the motor-generator set starts as before, but is not again connected to the direct-current buses until its voltage has come up to normal. In each battery circuit there is a resistor of proper value for modified constant potential charging, and in addition a fuse for short-circuit protection.

READERS' FORUM

Extends Credit for Pioneering House Services

To the Editor of the ELECTRICAL WORLD:

In my article, "Range Wiring Costs Reduced 30 Per Cent by New Assembly," appearing in the July 18 issue of the ELECTRICAL WORLD, it was stated that the Rome armored entrance cable was developed for the New York Power & Light Corporation. It has since been called to my attention that several engineers of the Associated System approached the General Cable Company in October, 1929, with the same thought in mind.

In order to do justice to the fine work of D. M. Thomas of Elmira, N. Y., and his associates, will you please print a correction to the effect that the cable was originally developed for them?

E. A. BRAND.

Buffalo, Niagara & Eastern Power Corporation,
Buffalo, N. Y.

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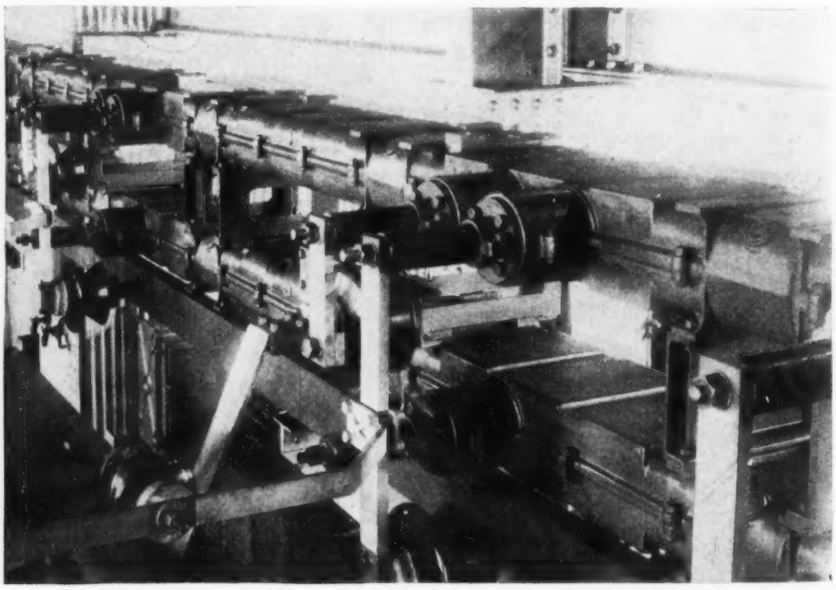
Metal-Clad Busbars Carry 250,000 Peak Amperes

To the Editor of the ELECTRICAL WORLD:

A recent issue of the ELECTRICAL WORLD gave some particulars of the East Pittsburgh circuit-breaker-testing plant of the Westinghouse company, including illustrations of the busbars and of the special methods used to brace them against the forces occasioned by asymmetrical instantaneous peak currents of 201,000 amp. These data indicate in a very definite way the difficulties with which engineers are faced when designing open-type busbars to carry very heavy short-circuit currents. Not only is a very large amount of space taken up, but the large number of porcelain supports required gives the general impression of an insulator store rather than of a busbar run.

As a contrast to this complicated and space-absorbing arrangement, the simplicity and compactness of metal-clad busbars stand out most impressively. Their use in positions where heavy short circuits may be experienced is shown in the accompanying illustration, which shows the main busbar connections of the Reyrolle short-circuit test plant at Hebburn-on-Tyne. The busbars are inclosed in compound-filled metal-clad chambers and insulated for a normal voltage of 22 kv. The over-all dimensions of each three-phase busbar unit are 16½ in. wide by 8 in. deep.

Although these busbars have to carry short circuits up to 250,000 peak amperes repeatedly, no special design was adopted, but standard commercial busbar chambers were used, except for special "tee-off" connections for coupling up resistances and reactances.



Some of the advantages of metal-clad busbars are as follows:

1. The chances of a failure of insulation are reduced to a minimum.
2. Short circuits between phases and between phases and earth are practically impossible.
3. Each busbar unit is factory-built and can be readily assembled on site.
4. Should a fault develop in metal-clad busbars, its effects are localized, whereas faults on open-type busbars usually spread and cause extensive damage.

H. W. CLOTHIER,
Director.

A. Reyrolle & Company, Ltd.
Hebburn-on-Tyne, England.

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The Bare Neutral

To the Editor of the ELECTRICAL WORLD:

The article by J. D. Noyes of Detroit in your issue of June 27 is very interesting. The electricity department of the British Municipal Council at Tientsin was started in 1920, and from the very outset every house service has been of the bare-neutral type. No switches, fuses or disconnections are allowed in the neutral wire, which is grounded at every possible point. The system is certainly correct in theory and has proved itself to be so in actual practice.

The system in use here is 380–220-volt, three-phase, four-wire. The average losses in transmission from the generating station to the consumer amount to 8.73 per cent for the whole year, which figure would be impossible with the 110-volt systems in favor in America.

The 380–220-volt system is so much cheaper than the systems with various combinations of 110 volts to 115 volts that it is a matter of surprise that engineers in America have not considered the higher-voltage distribution more than they have done.

The danger from 220-volt installations is so remote as to be virtually non-existent, but the saving in capital is enormous.

R. A. WILLIAMS,
Electrical Engineer.

British Municipal Council,
Tientsin, North China.

Men of the Industry

E. R. Davis Undertakes Broader Duties

E. R. DAVIS, manager of construction of the Southern California Edison Company, Ltd., since 1921, has been appointed manager of construction and engineering for the company. Announcement of the appointment was made by R. H. Ballard, president. Mr. Davis now has executive supervision and direction of both the engineering and construction departments.

Coincident with the announcement of

Mr. Davis' appointment, Mr. Ballard announced the creation of an engineering executive committee, consisting of Fred B. Lewis, vice-president and assistant general manager; H.A. Barre, chief engineer, and Mr. Davis.

Mr. Davis has been associated with the Southern California Edison Company, Ltd., and its predecessor companies since 1896. In 1911 he became general manager of the Pacific Light & Power Corporation, continuing in that capacity until 1917, when the Pacific Light & Power Corporation was merged with the Southern California Edison Company. Mr, Davis was appointed superintendent of the northern division of the Edison company at the time of the merger and was appointed manager of construction four years later. As manager of construction he was an outstanding figure during construction of the Edison company's Big Creek-San Joaquin River hydro-electric project in the Sierra Nevada mountains of central California.

CHARLES E. NORRIS, vice-president and secretary of the Niagara Hudson Power Corporation, has been elected president of Northern New York Utilities, Inc., to succeed the late John N. Carlisle.

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ROBERT A. MILLIKAN, scientist and executive head of the California Institute of Technology, sailed for Europe, September 6, aboard the North German Lloyd liner *Bremen*.. Dr. Millikan will visit Professor Einstein while in Germany.

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COL. HUGH L. COOPER, hydro-electric engineer, returned to New York, September 10, on the North German Lloyd liner *Europa* from Russia. Colonel Cooper thus completed his seventh trip in five years to Russia, where the company he heads, Hugh L. Cooper, Inc., is supervising the erection of a hydro-electric plant of 800,000 hp. capacity on the Dnieper River.

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H. G. Davis of Watertown Retires

HERBERT G. DAVIS, vice-president and general manager of the electric department of Northern New York Utilities, Inc., has resigned his position and will retire from active business. Mr. Davis presented his resignation to the officials of the Niagara Hudson Power Corporation, of which the Northern New York Utilities is a part, about a week ago.

Since the death of John N. Carlisle, for many years president of Northern New York Utilities, which occurred about two months ago, Mr. Davis has been the active head of the company. He has been associated with Northern New York Utilities for approximately fifteen years. In 1920 he was superintendent of production, having charge of the various power plants of the company under the late John B. Taylor. A few years later he became vice-president and general manager of the electric department of the company and has since held that position. Prior to his connection at Watertown, he was superintendent of the Ogdensburg Street Railway Company, the Ogdensburg Power & Light Company, all of which are now associated with the Niagara Hudson system. Samuel Abbey, who will take over the duties of Mr. Davis, joined the company in 1923 as assistant to Mr. Davis. Formerly he had been an electrical engineer with the General Electric Company at Schenectady.

M. G. Kennedy Vice-President in Wilmington

M. G. KENNEDY, who for many years has been connected with the properties of the United Gas Improvement Company, has been appointed vice-president and general manager of the Delaware Electric Power Company, Wilmington, and its subsidiaries. Mr. Kennedy had been general superintendent of electric and street railway operations for the U. G. I. and its subsidiaries for a number of years and has had a broad ex-

perience in the management and operation of public utility properties in this system.

Mr. Kennedy was born in Philadelphia and is a graduate of the University of Pennsylvania. He entered U. G. I. employ in 1900 as an electrical engineer. In 1908 he went to Syracuse, N. Y., as superintendent of the Syracuse Lighting Company, where he remained until 1912, when he was recalled by U. G. I. to Philadelphia. He subsequently advanced to the position of general superintendent of electric and street railway operations. Mr. Kennedy is a member of the American Institute of Electrical Engineers and of the American Society of Mechanical Engineers.

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HARVEY COUCH, president of the Arkansas Power & Light Company, has been named representative for Arkansas in President Hoover's Organization on Unemployment Relief.

OBITUARY

WILLIAM O. JONES, who had been connected with the Luzerne County Gas & Electric Corporation, Kingston, Pa., for 35 years, died recently in the Wilkes-Barre General Hospital following an illness of three weeks. At the time of his death he was an electrical engineer at the Plymouth plant.

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E. O. ZWIETUSCH, chief engineer of the Lorenz telephone and electrical instrument organization, died in Berlin recently as the result of an automobile accident. Mr. Zwietusch was born of German parents in the United States in 1866. After being connected with the Western Electric Company in Chicago for some years, he settled down in Germany in 1888 and became one of the leading authorities on telephones in that country.

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ALVA C. DINKEY, formerly president of the Midvale and Carnegie steel companies and a pioneer in the steel industry in Pennsylvania, died at his home recently after a three months' illness. He was 65 years of age and had been engaged in the steel industry since beginning work in the Edgar Thomson Steel Works at the age of 13. He became president of the Midvale Steel & Ordnance Company, later known as the Midvale Steel Company, in 1915. His interest was largely in the electrical end of the steel industry. Mr. Dinkey was a member of the American Society of Mechanical Engineers, the Engineering Society of Western Pennsylvania, the Engineers' Club of Philadelphia, the American Association for the Advancement of Science and the Academy of Natural Sciences.

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RALPH H. OBER, member of Jacobs & Ober, engineers of Seattle, Wash., died at his home August 30, at the age of 60. Mr. Ober was one of the designers of the Aurora Avenue Bridge, nearing completion in Seattle, and for 40 years had been connected with city and public works projects, both in the employ of the federal government and in private practice. Prominent among the projects in which he had engaged are the Cedar River pipe lines, the Cedar Lake storage dam, the Skagit River investigations and the Columbia Basin irrigation surveys. From 1908 to 1911 he was assistant city engineer of Seattle, and following that a member of the Board of Public Works and superintendent of buildings for the city. Born in Beverly, Mass., in 1871, he removed to Seattle in 1892, and had resided in that city since that time. Mr. Ober was a member of the American Society of Civil Engineers and a past-president of the Engineers' Club of Seattle.

Dr. Harry P. Davis

THE DEATH OF Harry Phillips Davis, vice-president and director of the Westinghouse Electric & Manufacturing Company, which was announced in the September 12 issue of the ELECTRICAL WORLD, brought to a close a career of wide achievement. His energy, application, ingenuity and versatility is revealed in nearly 80 patents issued to him for his developments in electrical apparatus. Under his engineering leadership many of the most

important advances of the electrical art were made, these relating to meters, measuring instruments, circuit breakers, railway control apparatus, tranmission equipments and radio.

His initiative and foresight were never more clearly demonstrated than in the start of the first broadcasting station, KDKA. At a time when the public and engineers thought of radio definitely as a means of private or point-to-point communication, Dr. Davis envisioned a service which radio might give over a wide area and to which every one might listen. He foresaw a service economically sound. That foresight was the birth of radio broadcasting, which Dr. Davis always considered a public service and a public trust.

For more than 21 of the 40 years during which he was connected with the Westinghouse company Dr. Davis was in charge of the company's engineering department and for fifteen years directed its engineering and manufacturing operations. Among his early achievements was his work in the electrification of the New York, New Haven & Hartford Railroad, the world's first single-phase railway electrification, a phenomenal engineering feat. He was a dominating factor in all phases of this electrification and others that followed.

Born in Somersworth, N. H., in 1868, Dr. Davis was graduated from the Worcester Polytechnic Institute with the degree of bachelor of science in engineering. He was connected with a number of corporations as a director, among these being the Westinghouse Electric International Company, Automatic Gear Shift Company, Radio Corporation of America, R.C.A. Photophone, Inc., Radio-Keith-Orpheum Corporation, and R.C.A. Victor Company, Inc. Dr. Davis held memberships in many engineering and scientific societies.

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DONALD F. WHITING, an electrical engineer associated with Fox Films, Inc., and formerly with the Bell telephone system, was killed September 7 when he fell from a tree while putting up a radio aerial on his property at Port Washington, L. I. He was 40 years of age. Mr. Whiting was born in Lowell, Mass., and was graduated from the Worcester Polytechnic Institute in 1915. He had to his credit several patents covering inventions in radio and allied fields. Mr. Whiting was a fellow of the American Institute of Electrical Engineers and a member of the Institute of Radio Engineers.

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LOUIS P. HALL, who had been connected with the American Gas & Electric Company for the past year as a representative of the commercial department, died suddenly, September 10, in East Liverpool, Ohio, in his sixty-fourth year. He had had extensive experience in the electrical industry, his career embracing connections with the public utility and manufacturing branches. He obtained a wealth of practical engineering with the old Baxter Electric Motor Company of Baltimore, the "C & C" Electric Company and with a Baltimore syndicate which sent him to Raleigh, N. C., to install and operate the street railway lines. Later he was engaged in operating and electrifying the Kansas City Elevated Railway and did some pioneer engineering work on properties which now constitute the Washington Railway & Electric Company, Washington, D. C. Subsequently Mr. Hall was connected with the Crocker-Wheeler Electric Manufacturing Company in Atlanta, Philadelphia and Washington, and then, after establishing an electrical contracting business in Washington and Baltimore, he removed to Chicago. Later he removed to New York, where as representative of the Conlon Corporation he found a contact with executives of utility holding companies.

Financial and Statistical News

SECURITIES have declined during the past week in a general selling movement, prices falling below the low points reached in June. Manufacturing companies were especially affected by the announcement that Western Electric had omitted its quarterly dividend. American Telephone & Telegraph immediately sold off and wide losses followed in Westinghouse and other industrials.

——UTILITY STOCKS WERE CHARACTERIZED BY PRONOUNCED WEAKNESS. This was especially true of the Chicago Exchange, where on Tuesday the Insull shares were the focal point of activity, almost all issues in this group breaking to record low prices. Middle West Utilities slumped badly, approximately 138,000 shares of this stock having been involved in the day's transactions in Chicago and New York. Insull Utility Investment also sold off sharply, but Commonwealth Edison and Public Service Company of Northern Illinois were fairly steady.

——ON THE NEW YORK CURB SHARP BREAKS OCCURRED in Insull Utility Investments, Central & Southwest Utilities, Middle West Utilities, American Superpower first preferred, National Electric Power A and Electric Bond & Share. ELECTRICAL WORLD index of common stocks is now 54.2 against 57.7 a week ago.

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July Output Closer to Last Year's

ENERGY GENERATED IN public utility power plants in July was closer to the corresponding output in the preceding year than has been the case in many months, according to statistics published by the United States Geological Survey. The output during that month, 7,730,775,000 kw.-hr., was only 2 per cent less than in July, 1930, whereas in June the deficiency was 3 per cent and in all the earlier months of the year it was larger. In January, for example, it was 8 per cent.

The normal seasonal decrease in the daily demand for electricity from January to July, based on eleven years of record, is 4.75 per cent, the Survey report states; the decrease this year was only 2.75 per cent. The figures indicate a fairly definite trend toward improvement in the demand thus far this year, as compared with last year. Compared with 1929 the output is down 4 per cent.

Regionally both New England and the East South Central States are up to last year's level; the South Atlantic States are above it by 2 per cent. The central industrial area is still down 4 per cent, the Southwest 10 per cent, the Mountain region 13 per cent. These comparisons plainly reflect industrial conditions in various parts of the country.

Output from water power in July was 2,735,938,000 kw.-hr. and constituted only 35 per cent of the total; it was 5 per cent below last year's July output, continues to decrease at about the same rate as in 1930, and is still influenced by drought conditions, which have reduced the flow of power streams.

The quantities here given should not be confused with those for central stations alone; they are based on the operation of all power plants producing 10,000 kw.-hr. or more per month engaged in generating electricity for public use, including plants for electric traction, Bureau of Reclamation plants, public works plants and that part of the output of manufacturing plants which is sold for public use.

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Public Service Corporation Launches New Campaign

OPPORTUNITY TO PURCHASE its $5 cumulative preferred stock under the popular ownership plan has been extended to its customers and the public by the Public Service Corporation of New Jersey. For ten years this company has engaged in this type of financing and in that period 185,570 subscriptions have been taken for the company's preferred stock. Terms of sale permit payment in full, or of $10 per share at the time of subscription and $10 per share per month for eight months, plus $10 per share and accrued dividend as the last payment.

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Urges Fairer System of Taxing Utilities*

By MARK GRAVES
New York State Tax Commissioner

THE tax problem presents a nest of difficult and perplexing questions crying to be answered. Are taxes too high? Is government spending too much? Is the tax load equitably distributed? Are we discriminating against public utilities?

At the outset, let me say that I have thus far been disappointed that the public utilities have not come forward and presented to the special temporary Tax Survey Commission any constructive suggestions of moment. An opportunity was afforded the public utilities to do so, but from a cursory examination of the stenographic report of that hearing, I conclude that representatives of the utilities are afraid to disturb the *status quo*. Admitting that it leaves much to be desired, they apparently fear that if the egg is scrambled the results may be inimical to their interests. An honest effort is being made by the state through its temporary Tax Survey Commission and its regular Tax Commission to revise the state and local revenue system in such a way as to secure a better and more equitable distribution of the tax burden. That cannot be accomplished without the cooperation and assistance of the various groups and classes of taxpayers.

New York's load heavy

It is important to the utilities because I estimate New York utilities will pay this year $50,000,000 for federal, state and local taxes. They paid more than $40,000,000 in 1929, and for that year it constituted 9.3 per cent of operating revenue and 26.3 per cent of operating income. Government takes more than $1 for every $2 the stockholders receive.

We have a variety of taxes imposed on public utilities. Consider, for instance, gas and electric companies. They may be taxed in four ways, namely:

1. The general property tax on real property.

2. The general property tax on the value of the privilege or right to occupy streets, highways and public places.

**Epitome of address before convention of Empire State Gas and Electric Association, Lake George, September 10.*

3. A tax of one-half or 1 per cent on gross earnings or gross receipts from all sources from intrastate business.

4. If they have declared dividends in excess of 4 per cent, a 3 per cent tax is levied on such excess.

We have a system of assessment in this state which requires the local assessors of each town, city and village to assess public utility property as well as other property. That is ridiculous. Almost without exception, these local assessors have no notion or conception of the value of such properties. They usually guess at it or perhaps ascertain reproduction cost and allow depreciation. They know nothing of the financial condition of the company except rumor.

For this situation I have a definite remedy to propose. It is that the authority to assess all public utility property be removed from the jurisdiction of the local assessor and vested in a state authority such as the State Tax Commission. That commission can then appraise and value the property on a system, or at least a state-wide basis, and apportion the aggregate value so determined according to an equitable formula between the various tax districts where the property is situated.

Next we have the special franchise tax—the general property tax levied upon the valuation fixed for the right or privilege to have your property in the streets, highways and public places. That law is now wholly obsolete. I respectfully submit to you that the special franchise tax law should be repealed.

We now come to the gross earnings or gross receipts tax and the excess tax on dividends, plus also, in the case of railroads and wire companies, the mill tax on net worth. The gross earnings tax is not imposed on what we are accustomed to think of as earnings, but rather on gross receipts from all sources. The gas or electric company pays not only on its receipts from the sale of gas or electric current, but also upon its gross receipts from the sale of merchandise and its income from investments and other sources. It seems to me that there should be substituted for these taxes a single tax based upon either gross earnings or net income, or perhaps it should be what tax men call a "gross-net tax."

If the taxes are too high the rates will be forced up, with the result that:

(a) Consumption will be reduced and a deadening effect on revenue result. The law of diminished returns will inevitably operate.

(b) Industrial development in the state will be retarded because industry will look for places where rates are lower. The operating business is now done on such a small margin that a slight increase in the cost of production means the difference between a profit and a loss.

Lastly, it will be possible to exact so much from the consuming public as to make the exaction an unfair distribution of the tax load as regards them. Just what the rate or rates should be, and whether it should be upon gross or net, or based partly on each, I am not prepared to say. A decision can only be reached after mature consideration. I am undertaking to tell you people, however, that in my opinion the state's method of taxing public utilities is illogical; that it works injustice in many cases; that some features are impossible of administration, and that much can be accomplished if representatives of the state and of the utilities get together and work out a simpler, better and fairer tax program.

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Weekly Output Down 4.1 per Cent

WEEKLY ENERGY OUTPUT in the recent past, as estimated by the statistical research department of the National Electric Light Association, with corresponding figures for the three preceding years, was as follows:

	1931	1930	1929	1928
August 8	1,643	1,692	1,730	1,558
August 15	1,629	1,677	1,733	1,567
August 22	1,643	1,691	1,750	1,576
August 29	1,638	1,688	1,762	1,586
September 5	1,636	1,630	1,675	1,484
September 12	1,582	1,727	1,806	1,604

Throughout August the returns show an output running quite uniformly about 3 per cent less than in 1930. The first two weeks in September are not separately comparable with those of preceding years, because Labor Day this year is included in the second, whereas it affected the first September figure in the other years.

Combining them, it appears that for the first fortnight in September the 1931 returns, compared with those for 1930, are down 4.1 per cent.

Jersey Utility Issues Preferred Stock

CUMULATIVE PREFERRED STOCK, 5½ per cent series, has been issued by the Jersey Central Power & Light Company to the amount of $6,000,000, the price being 100 and accrued dividend. Proceeds from the sale of this stock have been used in connection with the acquisition of properties heretofore owned by the Eastern New Jersey Power Company.

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NEWS BRIEFS

Jersey Central Power & Light Company has declared an initial quarterly dividend of 1⅜ per cent on the 5½ per cent preferred stock, par $100, payable October 1 to holders of record September 10.

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Citizens Power & Light Company, Council Bluffs, Iowa, has added to the board of directors Joe W. Smith to succeed the late Emmet Tinley.

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Old common stock of the Philadelphia Company, par $50, was stricken on September 9 from the New York Stock Exchange list. Last September this stock was converted into stock without par value on the basis of five new shares for each old share.

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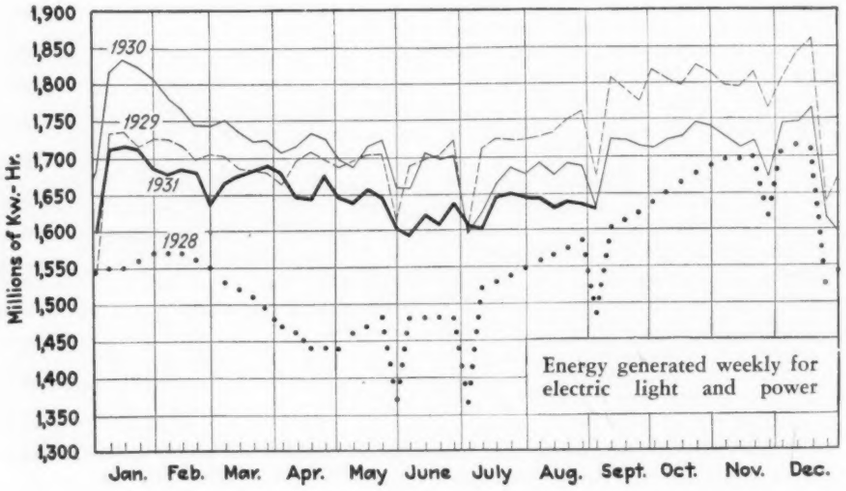
Refunding program for this year has been completed by the Pacific Gas & Electric Company. The company had $12,507,000 cash on hand on September 10 and had to retire less than $2,200,000 face value of underlying bonds by the end of the year. An increase of authorized bond limit from $250,000,000 to $500,000,000 has been approved by the stockholders and submitted to the California Railroad Commission, but no immediate financing is contemplated.



Summer Valley in Industry Curve

MANUFACTURING activity in August maintained virtually the identical level as in July, according to returns of electrical energy consumption in individual establishments, received by the ELECTRICAL WORLD in its monthly survey and analyzed by industry groups. The level at present is 8.5 per cent lower than a year ago.

The month's changes in the several groups were, on the whole, remarkably small. A 6 per cent drop in the iron and steel industry was balanced by an equal rise in metal working. In automobiles, including parts and accessories, the index fell another 22 per cent. This is an abnormal change. Coming on the heels of an unusually low July figure (ELECTRICAL WORLD, August 15, 1931, page 303) it cuts last year's August index in half. In contrast, paper and pulp rose 17 per cent, recovering from the lower values of the preceding two months and overshooting last year's August figure.

Food products continue close to the record-breaking maximum of July. Rubber products did not accompany automobiles in the downward move; instead, the index rose 1 per cent. Although there was a decline in textiles, it was unusually small for the season and leaves this industry 31 per cent higher than at the same time last year.

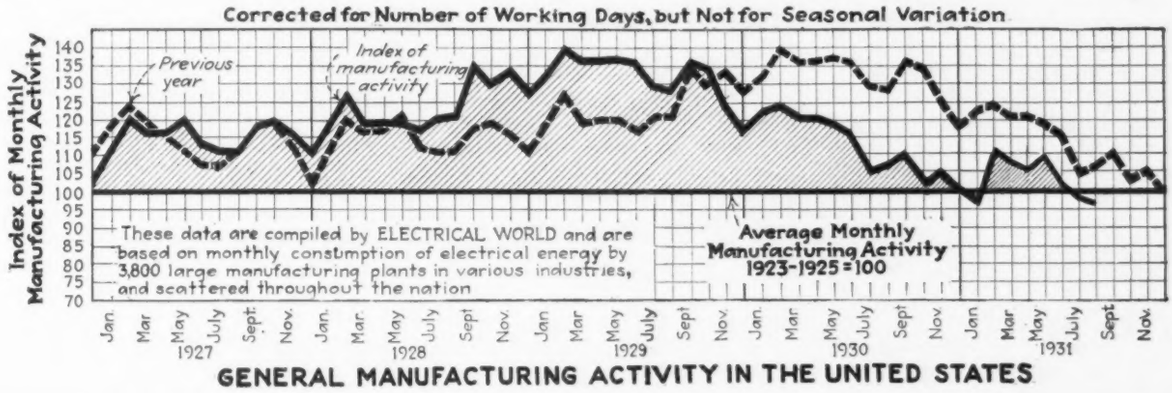
The only regional average that increased from July was the Middle Atlantic, 4 per cent. The rise included food products, iron and steel, metal working, the stone-clay-glass industries (5 per cent) and textiles (8 per cent). Textiles gained also in the North Central region (11 per cent), but fell severely in New England. This accounts in part for the 10 per cent decrease in the New England average.

The North Central 2 per cent drop was chiefly in automobiles. Rubber fell 10 per cent; pulp and paper gained, also metal working. The South is slightly above last year, but 4 per cent off from July, with textiles even, paper up, most others down.

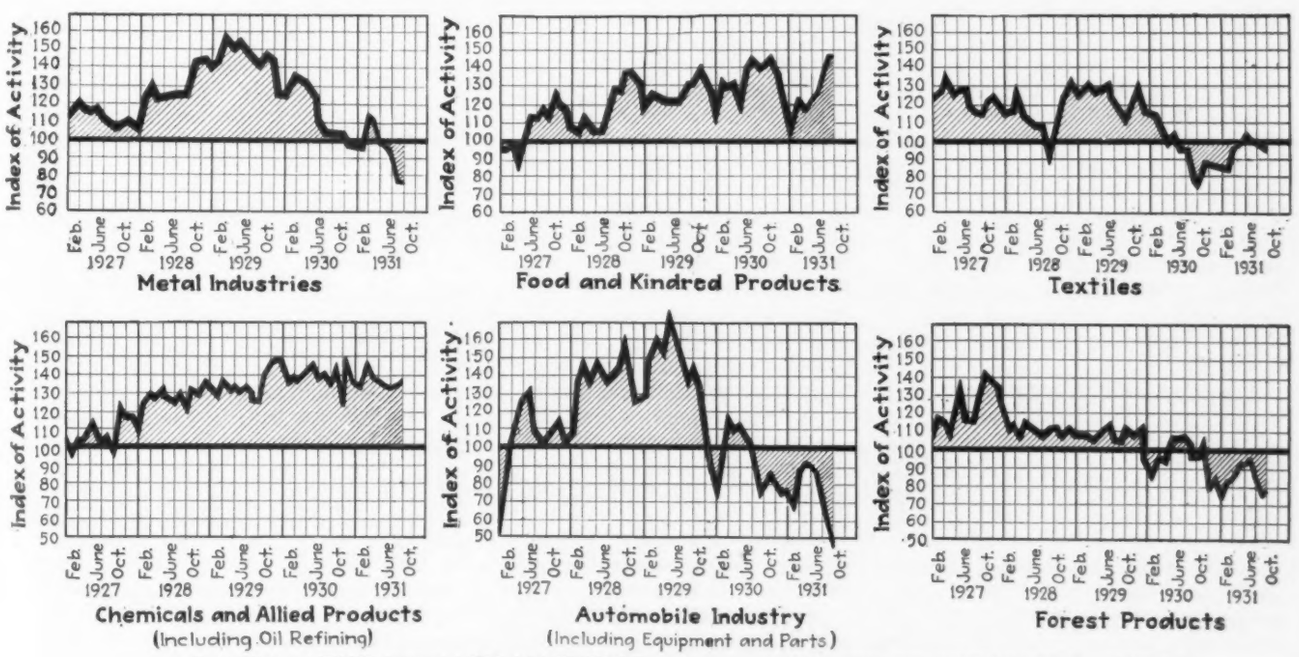
Index of Manufacturing Activity

Base Average Month, 1923-25

	August,	July,	June,	May,	August,
Industrial Groups	1931	1931	1931	1931	1930
All Industry	**97.3**	**97.9**	**101.7**	**109.8**	**106.3**
Automobiles (including parts and accessories)	43.6	55.9	71.3	89.7	86.6
Chemical products (including oil refining)	137.6	137.7	132.7	133.8	135.7
Food products	146.4	147.0	136.2	126.8	141.2
Iron and steel	78.0	83.1	86.6	106.6	112.0
Metal working	73.3	69.3	78.6	94.0	95.2
Leather products	77.1	83.8	85.4	81.0	87.7
Forest products	79.4	76.9	86.3	97.2	97.7
Paper and pulp	121.7	104.0	112.4	135.1	115.1
Rubber products	98.5	97.4	121.0	122.3	110.5
Shipbuilding	85.6	82.0	84.8	89.7	122.8
Stone, clay and glass	105.9	104.8	118.7	132.0	118.2
Textiles	95.0	98.2	100.5	103.7	72.5


Corrected for Number of Working Days, but Not for Seasonal Variation
Index of Monthly Manufacturing Activity
Previous year
Index of manufacturing activity
These data are compiled by ELECTRICAL WORLD and are based on monthly consumption of electrical energy by 3,800 large manufacturing plants in various industries, and scattered throughout the nation
Average Monthly Manufacturing Activity 1923-1925=100
1927
1928
1929
1930
1931

GENERAL MANUFACTURING ACTIVITY IN THE UNITED STATES



ACTIVITY IN THE PRIMARY MANUFACTURING INDUSTRIES OF THE UNITED STATES

Business News and Markets

Westinghouse Makes Changes in Sales Organization

RECENT changes in the sales organization of the Westinghouse Electric & Manufacturing Company have been made to direct greater attention to industry lines. The headquarters sales organization, reporting to J. S. Tritle, vice-president and general manager, consists of five principal groups: First the industrial department, under O. F. Stroman, sales manager; second, the transportation department, under M. B. Lambert; third, the central-station department, under R. A. Neal; the merchandising department at Mansfield, under Claxton E. Allen, commercial vice-president, and, fifth, the diversified products department, under A. C. Streamer as sales manager. All of the five sales departments, with the exception of the merchandising group, whose headquarters will be in Mansfield, will be in East Pittsburgh.

Under the industrial department, B. Lester becomes assistant sales manager and has reporting to him five managers, each having charge of a certain group of industries. These men are G. E. Stoltz, C. D. Bowne, J. W. Speer, F. E. Mead and E. B. Bremer. Likewise, under C. B. Stainback, assistant sales manager, are nine apparatus sales managers, J. R. Olnhausen, R. M. Davis, R. O. Watson, D. H. Byerly, W. W. Reddie, T. C. Kelley, W. G. Balph, W. H. MacGillivray and F. W. Horst.

Under R. A. Neal, manager of the central-station department, are G. A. Sawin, as assistant sales manager; C. F. Lloyd, manager of the industry division; A. C. Farmer, distribution apparatus manager; H. W. Smith, generating apparatus manager; N. S. Taylor, manager of the switchgear section, and George H. Cox, manager of steam apparatus, located at the South Philadelphia works.

Associated with Mr. Lambert, transportion sales manager, are F. H. Shepard, who is director of heavy traction, and A. J. Manson, assistant sales manager, to whom report four industry managers and four apparatus sales managers.

The diversified products department, under the leadership of A. C. Streamer as sales manager, includes widely diversified activities. L. A. S. Wood, located at Cleveland, will have charge of street lighting and commercial lighting; J. S. McNulty, located at the Trafford Works, will head the sale of "Micarta" and insulation products; L. R. Botsai will have charge of the gearing products manufactured at the Nuttall Works at Pittsburgh; H. M. Wible, at Mansfield, will be manager of the commercial cooking products group, and F. E. Eldredge, at Chicopee Falls, Mass., will be manager of the radio products division, having charge of this important group other than radio receiving sets.

Claxton E. Allen, commercial vice-president, remains in charge of the merchandising department, with M. C. Morrow as sales manager, Frank R. Kohnstamm as merchandise manager and Le Roy Staunton advertising manager of the merchandise department.

R. R. Davis has been appointed apparatus advertising manager, located in East Pittsburgh; R. W. Clark, sales promotion manager, and J. H. Waxman, assistant sales promotion manager.

An important new development has been assigned to T. J. Pace, who has been appointed assistant to vice-president and who will have charge of market research and sales analysis.

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Litigation Settled in Time-Switch Field

RECENT VERY ACTIVE litigation in the time-switch field has finally been settled out of court to the apparent satisfaction of all concerned. Moreover, a new selling combination has been launched to market a complete line of time and temperature controls, including Tork clocks, Horolectric time switches, Hartford time switches, Welsbach time controls, Chielmetti and Novitas Swiss-made time switches and General Automatic time and temperature controls.

General Automatic Controls, Inc., with executive offices at 12 East Forty-first Street, New York, markets all of the above lines.

This consolidation of interests is believed to place the several manufacturers involved in a very strong patent position on the latest forms of time switches and similar controls. All the above manufacturers have authorized the Time Controls Repair Corporation, 116 West Fourteenth Street, New York, to handle repairs and replacements on all the kinds of time and temperature controls. In addition, the Time Controls Repair Corporation protects the factory guarantees on all lines sold by General Automatic Controls, Inc. This is common practice in the automobile business, but is new in the field of automatic electrical controls.

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Radio City Buys 15,000 Miles of Wire

A CONTRACT HAS BEEN AWARDED to the Anaconda Wire & Cable Company for 7,800,000 ft. of copper wire in varied sizes and types to be used in the construction of Radio City, in New York, the Metropolitan Square Corporation announced. The contract was said to be the largest of its kind ever let for a building operation. Placed end to end the individual strands would cover a distance of 15,000 miles.

The American Brass Company, Waterbury, Conn., has been awarded a contract for most of the brass and copper products, exclusive of the cable and wire. The award, also referred to as the largest of its kind, included brass pipe, sheet copper and copper in rolls. The pipe, varying in diameter from ⅛ in. to 8 in., would make a tube 200 miles in length.

Many construction records already have been broken in the orders for materials for the development. Contracts have been let for about 25,000 tons of steel, to be delivered as needed, and for 1,000,000 sq.ft. of glass.

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TRADE BRIEFS

Square D Company has declared a dividend of 27½ cents a share on class A stock, compared with 55 cents paid previously.

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Announcement has been made by the Allis-Chalmers Manufacturing Company of new orders totaling $1,006,000 as a result of the recent acquisition of the American Brown Boveri Company, Inc., and the Condit Electrical Manufacturing Corporation. The orders included contracts for $350,000 with the Long Island Railroad, $460,000 with

the Commonwealth Edison Company and $110,000 with the New York Edison Company. In addition, the Condit Electrical company has received an order of $86,000 at Hyde Park, Boston, Mass.

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Diamond Electrical Manufacturing Company, Ltd., has omitted the dividend on common stock.

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Board of directors of Westinghouse Electric & Manufacturing Company declared a dividend of 1¼ per cent, amounting to 62½ cents per share, on both common and preferred shares (payable October 31 to stockholders of record September 30), payment of which will make a total of 7¾ per cent paid this year on the par value of both classes of stock, which compares with 10 per cent paid in 1930.

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New York Metal Prices

	Sept. 9, 1931 Cents per Pound	Sept. 16, 1931 Cents per Pound
Copper, electrolytic	7½	7.20
Lead, Am. S. & R. price	4.40	4.40
Antimony	6.50-6.60	6½
Nickel, ingot	35	35
Zinc, spots	4.15	4.10
Tin, Straits	25.75	25.05
Aluminum, 99 per cent	23.30	23.30

Middle Atlantic Industries Hold Level

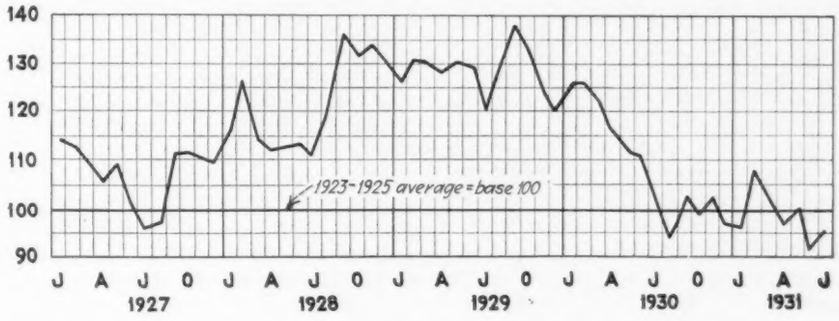
DURING the past year industrial activity in the Middle Atlantic States has fluctuated between relatively narrow limits, compared with the peak in 1929. Index numbers based on monthly returns received by the ELECTRICAL WORLD showing electrical energy consumption in numerous representative establishments are given in the accompanying table.

They have been worked out for major industry groups and are here published in response to requests for regional data similar to those announced each month for the United States as a whole. The indices for "all industry" are computed from the weighted monthly indices for the individual groups.

Corresponding information for New England appeared in the ELECTRICAL WORLD of September 5, 1931, on page 437.

"Electrical World" index of industrial activity, Middle Atlantic States

Based on returns of electrical energy consumption. Adjusted to 26 working days.



Indices of Industrial Activity in Middle Atlantic
(Adjusted for 26 Working Days)

	1927 Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	1928 Jan.	Feb.	March	April	May	June
All Industry	114.0	112.5	109.6	105.9	108.8	101.9	96.0	97.4	111.6	111.5	110.4	109.9	116.2	126.6	114.2	112.0	112.9	113.4
Automobiles	78.2	103.4	118.3	98.2	121.6	91.6	80.2	69.3	109.5	133.7	109.7	104.0	154.2	180.8	159.2	171.2	177.3	188.4
Chemicals	95.2	105.3	103.1	105.4	109.3	105.1	109.5	101.5	129.3	115.5	114.3	107.3	129.0	134.0	127.6	133.4	135.7	133.0
Food	.....	.....	.....	77.2	90.4	85.8	85.6	80.3	103.3	93.5	101.0	97.0	93.0	103.0	95.3	92.4	87.2	93.8
Iron and steel	113.8	114.3	107.7	107.3	106.6	104.2	98.4	94.1	110.7	103.4	106.3	101.4	114.4	124.4	110.3	108.4	107.6	106.2
Metal working plts.	.....	.....	.....	.....	.....	106.6	107.4	104.8	115.8	124.4	107.7	101.5	110.5	120.8	107.4	109.9	111.2	113.4
Metals group*	113.8	114.3	107.7	107.3	106.6	105.4	102.9	99.5	113.3	113.8	107.0	101.4	112.4	122.6	108.9	109.1	109.4	109.7
Leather	117.9	122.2	118.8	119.0	105.8	98.6	91.9	100.9	111.6	107.7	113.5	115.0	119.0	122.0	117.7	120.9	108.3	105.2
Lumber	.....	.....	.....	132.5	159.5	134.8	123.2	130.4	145.6	121.2	117.2	104.5	102.6	114.0	106.4	104.5	104.0	102.1
Paper and pulp	133.2	121.8	126.4	123.8	129.5	116.4	111.8	112.8	119.0	126.5	127.0	123.5	113.4	118.7	112.2	112.5	122.3	111.8
Stone, clay and glass	.....	.....	.....	111.6	120.4	104.4	104.0	110.8	116.2	112.5	106.7	97.6	103.9	116.9	118.0	124.3	132.4	132.8
Textiles	121.0	111.8	107.9	108.3	105.3	102.3	87.2	97.8	109.7	108.5	121.2	120.0	119.8	130.2	114.0	104.0	105.0	105.2

	1928 July	Aug.	Sept.	Oct.	Nov.	Dec.	1929 Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
All Industry	110.8	118.8	136.0	131.9	134.0	126.8	126.7	130.7	130.5	128.0	130.4	129.5	120.5	127.5	138.0	133.0	124.3	120.5
Automobiles	172.8	148.5	180.2	137.4	116.0	123.7	123.7	188.8	151.8	172.9	98.8	77.6	98.0	159.0	162.4	92.1	100.8	107.3
Chemicals	141.8	130.4	143.4	137.2	143.3	140.3	140.9	148.7	134.8	139.2	127.5	152.0	165.2	140.4	151.6	157.8	156.7	162.0
Food	101.9	113.4	130.4	119.8	106.1	90.2	93.0	98.0	91.1	83.2	91.2	97.3	92.4	103.2	107.0	80.3	90.5	86.1
Iron and steel	110.7	114.0	148.0	150.4	143.0	135.8	143.2	154.0	155.4	152.3	158.7	149.2	141.5	141.8	141.8	144.2	106.7	106.8
Metal working plts.	105.4	105.2	123.2	126.2	134.5	130.2	127.8	145.0	132.3	140.2	142.7	135.7	109.0	122.7	156.0	146.2	130.1	136.5
Metals group*	108.2	109.5	136.2	138.6	138.9	133.0	135.7	149.9	144.2	145.7	150.8	142.8	123.0	131.0	149.8	145.2	119.9	123.8
Leather	100.1	108.4	124.2	123.2	128.4	113.7	113.7	145.7	119.4	80.8	121.8	100.0	100.1	106.7	112.8	138.2	122.2	118.9
Lumber	126.0	129.5	136.5	130.6	124.4	125.0	112.0	138.0	120.2	127.7	113.8	142.5	105.1	123.2	117.5	112.0	93.2	80.7
Paper and pulp	105.5	106.2	104.9	115.0	118.4	110.5	107.3	105.5	119.8	106.5	122.2	101.0	91.8	105.1	110.8	115.7	110.8	106.9
Stone, clay and glass	134.2	135.0	149.8	138.5	144.6	137.8	132.2	142.4	136.2	133.4	141.8	149.2	149.3	151.2	160.4	160.4	143.2	136.8
Textiles	102.9	114.4	125.8	129.0	140.8	131.5	130.0	145.7	127.7	121.3	130.6	129.1	127.2	135.0	145.2	141.4	139.4	124.8

	1930 Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	1931 Jan.	Feb.	March	April	May	June	July
All Industry	125.8	126.0	122.2	117.2	112.3	111.8	102.9	94.3	103.1	99.6	103.5	97.5	96.6	108.0	102.8	97.6	101.3	91.5	95.7
Automobiles	146.4	166.6	97.4	117.2	101.8	114.9	65.5	76.2	93.8	64.7	85.5	85.6	75.9	86.8	83.8	92.7	97.2	65.6	43.2
Chemicals	146.6	146.0	150.0	150.1	154.3	149.0	146.4	138.8	148.5	116.2	144.4	140.1	139.2	146.0	142.8	146.5	145.2	131.3	155.2
Food	90.0	102.6	95.3	98.3	101.7	96.3	103.0	95.5	106.3	101.0	85.3	64.5	82.3	92.4	80.9	90.4	96.9	109.5	117.1
Iron and steel	126.8	120.8	114.8	110.2	110.7	109.9	88.0	88.1	84.7	92.5	94.5	92.3	90.5	116.5	106.6	92.6	94.3	81.0	72.0
Metal working plts.	147.4	143.8	137.9	121.6	108.0	110.4	102.2	94.7	99.5	84.2	102.1	102.5	99.2	91.7	111.3	83.3	83.0	68.6	64.3
Metals group*	138.4	133.9	128.0	116.6	108.6	110.0	96.1	93.0	93.0	87.8	98.0	98.0	95.5	96.6	109.3	87.3	88.0	74.0	67.5
Leather	117.8	98.4	84.8	98.8	72.3	84.8	70.5	80.3	78.5	91.8	73.6	84.0	77.6	81.9	75.2	99.8	85.0	108.1	88.7
Lumber	72.7	87.9	109.3	102.6	106.2	69.5	111.0	89.5	97.6	75.3	85.8	108.0	66.5	93.3	65.0	73.6	80.1	68.1	95.0
Paper and pulp	111.5	114.2	113.4	104.6	106.2	99.5	92.0	86.7	95.4	94.5	92.0	91.0	70.8	87.5	69.2	74.0	76.4	68.0	66.8
Stone, clay and glass	120.6	128.8	115.5	115.8	102.7	120.2	94.8	99.8	90.2	92.8	101.9	91.0	86.1	98.2	92.8	96.7	123.5	99.5	97.3
Textiles	131.8	127.4	130.3	122.4	114.6	118.0	106.4	85.3	104.8	118.3	112.0	98.0	102.6	108.0	117.8	108.3	113.8	101.0	114.4

*Weighted average of two preceeding items.

Market Conditions

BUSINESS conditions are practically unchanged, interest in buying remaining at a low ebb. In the East encouraging factors have begun to appear, but they are confined to the large manufacturers. Smaller manufacturers retain their pessimistic attitude.

——IN NEW ENGLAND BUYING WAS STEADY, although it was maintained at a low level, and the Middle West reports spotty industrial activity.

——THE SOUTH—BOTH EAST AND WEST—showed indications of increased activity.

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EASTERN

—WHILE ENCOURAGING FACTORS *are beginning to show in the electrical equipment market in the Eastern district, it is exceedingly difficult to overcome the inertia which has beset the local trade in this section and a pessimistic attitude still predominates among the smaller manufacturers of equipment. On the other hand, some of the larger producers are not only making the best of the situation, but are actually capitalizing the condition by pushing sales to completion, where smaller competitors are not, and using present attractive price levels to that end.*

—IN CONSEQUENCE, *both central station and industrial accounts have developed improved business during the past week and the upward trend bids fair to continue. As intimated, the smaller producers of electrical equipment might well take pattern after the larger and more progressive interests, where orders seem now to be centered.*

A New York manufacturer has closed with a Long Island central station for transformers and switchgear to an amount of $200,000, while another order for switchgear has been secured from a central New York power company, totaling $45,000. General Electric Company will furnish equipment for a hydro-electric power installation in Virginia, the order for water-wheels being placed with the S. Morgan Smith Company.

A manufacturer of hoisting machinery at New York has contracted with a local maker for electrical equipment for steering gears, etc., to an amount of $30,000. Maloney Electric Company will furnish a quantity of transformers for a central station in Louisiana. Habirshaw Cable & Wire Company is the successful bidder for submarine cable for the United States Army at Memphis, Tenn.

Signs of better business are shown by reports from the iron and steel industry, textile, chemical and paper fields, and there are indications that increasing interest in motors, controls and other electrical equipment can be expected from these lines. A manufacturer of radio tubes in New Jersey has secured a contract for 250,000 tube units and will advance production. A mail order house in Chicago has entered the electric refrigerator field and plans national distribution of a new unit at low price levels within six months.

A low bid of $40,590 has been tendered by the Auf der Heide Contracting Company, West New York, N. J., for floodlight towers on the Fort Lee side of the new George Washington bridge over the Hudson River; there were six other bidders, with high figure of $58,100. Westinghouse Electric & Manufacturing Company has secured an order for airway beacons from the Department of Commerce, comprising the most powerful units yet constructed, with range of 35 miles.

CONSTRUCTION PROJECTS

Port of New York Authority, New York, will soon award contracts for fifteen-story inland freight terminal to cost about $15,000,000 with equipment. Department of Sanitation, New York, contemplates fund of $200.000 for improvements in marine equipment and plant apparatus. State Board of Education, Trenton, N. J., will receive bids until October 6 for building units at manual training and industrial school for colored youths, Bordentown, N. J. Board of Education, Pottstown, Pa., will build a power plant at the Hill School. Duncan Macdonald, care of Blairsville Chamber of Commerce, Blairsville, Pa., plans plant for production of steam power units for motor trucks, to cost over $90,000. Department of Commerce. Washington, D. C., will receive bids until September 24 for quantity of steel tape armored cable (Proposal 23715). Bureau of Supplies and Accounts, Navy Department, Washington, D. C., will receive bids until September 22 for electric cable for Eastern yards (Schedule 6532).

SOUTHWEST

—THE FAVORABLE TONE *in electrical business noted last week continues, with somewhat increased optimism on the part of manufacturers and utility operators. Some delayed pole line construction has been started. Several carloads of poles and hardware have been shipped to Illinois points.*

One lot of insulators costing $1,800 was reported and orders for cables amounting to $4,500. Other contracts closed are as follows: Three transformers, each 100 kva., for Illinois coal fields costing $3,500; another bank of three transformers, same size, costing $3,000, for a rural line under construction; a lot of meters for $4,000; two lots of distribution transformers, one for $4,000 the other $5,000, and two whiteway street-lighting jobs.

CONSTRUCTION PROJECTS

Board of Public Works, Kansas City, Mo., has approved plans for hangar and other buildings at municipal airport to cost about $250,000. Commanding Officer, United States Army, Air Corps, Duncan Field, San Antonio, Tex., plans group of engineering and mechanical shops to cost over $500,000. Texas Power & Light Company, Dallas, Tex., is clearing final right-of-way, 40 miles, for transmission line from generating plant at Trinidad to Arp, Tex., total distance of 75 miles, and will build large power substation for industrial service at last noted place; company also plans installation of ornamental street-lighting system for 34 blocks at Temple, Tex.

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SOUTHEAST

—ACTIVITIES IN THE *Southeast looked up a bit last week, though most of the activity was in industrial circles. A Georgia power company ordered power cable amounting to in excess of $12,000 and $8,300 of bare and weatherproof copper wires was purchased by the same company. One company's distribution transformer orders in the past ten days totaled $5,800. Another central-station order was for $3,900 worth of meters.*

Contract was let at Fort Benning, Georgia, covering the installation of underground duct lines to serve ventilating equipment in the officers' quarters and $7,500 worth of electrical materials and equipment was involved. A contract for a South Carolina textile mill extension was let last week and will involve $5,000 worth of electrical materials. A textile plant in Georgia ordered $2,000 worth of motors and control equipment, while a government hospital in Alabama purchased $2,500 worth of panelboards and switches. A

bakery in Tennessee ordered $600 worth of safety switches and an air field in Virginia ordered $400 worth of the same equipment. Bids are in this week covering synchronous motors and pumping equipment for the city of New Orleans and it is estimated that this business will run in the neighborhood of $35,000.

CONSTRUCTION PROJECTS

Treasury Department, Washington, D. C., has plans for a multi-story federal building at Norfolk, Va., to cost $1,500,000. Marshall Manufacturing Company, Rome, Ga., plans improvements in woodworking and lumber plant to cost close to $100,000. Bureau of Supplies and Accounts, Washington, D. C., will receive bids until September 22 for one gasoline engine-driven electric generating set, one switchboard, one panelboard and cabinet for navy yard at Pensacola, Fla. (Schedule 6455)

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MIDDLE WEST

—VERY LITTLE, IF ANY, *change in general business conditions was observed this week in the Middle West section. Industrial activity continues quite spotty, although some seasonal increases are noted.*

—DISCOURAGING RUMORS *of further wage reductions are being heard, adding to an already disturbed situation. The major industries are quietly marking time, endeavoring to maintain present production schedules.*

Car loadings are expected to show a decline and railroad equipment and maintenance purchasing is still off to a marked extent. The mildly optimistic attitude noticeable the first of the month is being dissipated to a certain extent by reactionary stock market action and unfavorable dividend announcements. The production of electrical energy, however, continues to hold up satisfactorily and wholesale and retail trade remains fairly constant. Although mail order sales in dollar value are off some 12 per cent from a corresponding period last year, sales in tonnage in some instances are actually greater.

CONSTRUCTION PROJECTS

Board of Vocational Education, Oshkosh, Wis., is asking bids until September 22 for new school unit to cost about $200,000. University of Notre Dame, South Bend, Ind., has filed plans for addition to power plant to cost more than $75,000. Eli Lilly & Company, Indianapolis, Ind., plans multi-story addition to pharmaceutical and chemical plant to cost over $500,000. Board of Education, Minneapolis, Minn., has approved plans for first unit of vocational training school to cost $400,000. Iowa Public Service Company, Sioux City, Iowa, has secured permission to construct a transmission line, 36 miles long, in Monona and Woodbury counties, and for extensions in transmission lines in other counties.

PACIFIC COAST

—AUGUST BUILDING PERMITS *keep their respective proportions, the various coast cities showing an average loss of 30 per cent over 1930 except San Francisco, which for eight months of 1931 runs 6 per cent over 1930. Government construction is very large with many jobs close to the awarding stage.*

Orders include an immediate outlay of $750,000 on an eventual $3,000,000 expenditure in the Alameda air base and revisions in the distributing system of the San Diego government plant, a new $1,000,000 federal building for Phoenix, an award for a $15,000 fixture job in the Hawaiian Islands, a $12,000 electric award for Fort Lewis in Washington, a redesigned electric system for the Palo Alto veterans' hospital, a pole job for the Presidio and new post offices figuring $250,000 for Palo Alto, $350,000 for Glendale and a $750,000 addition for San Francisco.

Lighting business includes 66 duplex street lights for Santa Cruz and an $8,500 contract for San Jose, a 500-piece assorted part renewal and replacement order for southern California, 46 duplex and 50 single fixtures for South San Francisco, besides smaller jobs for Glendale and Modesto. Machinery manufacturers report no sizable order for the past ten days. Interesting inquiries include a twelve-month supply of pins and crossarms for the city of Los Angeles, an electrical equipment for a series of overnight motor inns averaging $200,000 each, of which seven or ten will be built this year; auto switches and transformers for a new $15,000 substation at Lodi and one for $100,000 at Vallejo, seat of the government navy yards; twelve electric welding motor-generator sets for the San Francisco school department, $1,000 worth of special testing ammeters and $15,000 worth of General Electric turbine and generator spares for the Pacific Gas & Electric System.

Slight improvement in motor and miscellaneous electrical item sales were noted last week, but the apparatus movement was reported to be negligible, with no orders of consequence in sight. The oil burner business is booming and numerous sales of safety switches and 1/6-hp. motors are reported. Included in sales were 115-amp., 220-volt General Electric time switches bought by the Puget Sound Power & Light Company for domestic water heaters, 250 orders involving 40 motors from 50 hp. down, the machines going to lumber mills and small industrials; 25 transformers from 1½ to 7½ kva., one 125-hp. motor to a lumber mill, fteen smaller machines from 25 hp. dc n to irrigation districts and dealers ınd 50 machines from 100 hp. down to pulp and paper mills and miscellaneous sources.

Tacoma on September 28 will open bids for three horizontal, single-stage, double-suction centrifugal pumps of 5,000 g.p.m. capacity at 235-ft. head, equipped with 350-hp. motors, costing about $14,000.

CONSTRUCTION PROJECTS

Pasadena, Calif., will soon take bids for ornamental street-lighting system using double light metal standards. Montgomery Properties, Inc., Los Angeles, Calif., has plans for an automobile service, repair and garage building to cost $115,000. Department of Highways, Olympia, Wash., will receive bids until September 29 for bridge and approach lighting system.

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NEW ENGLAND

—MAINTENANCE OF A *steady though low level in buying is reported in this district, with heavy electrical machinery interest at a low mark, though negotiations continue for small turbo-generators and control.*

—SMALL MOTORS ARE SELLING *well and some upturn in activity is reported by manufacturers. Bids for 28 motor-driven ventilating fans for a new vehicle tunnel are being considered.*

Central-station supplies are dull and small switch and control equipment sales have fallen off recently. Line materials are in less demand, though short extensions have effected small sales. Some specialties are of interest and indicate encouraging trends, such as air-conditioning equipment which is being studied and commercial cooking equipment, orders for which are pending. Street lighting is receiving attention and traffic signal extension is planned for a large Boston district. One representative reports a gain in electric arc-welding inquiries and notes recent sales for two units, while another reports the sale of a 300-kw. enameling furnace to a prominent stove manufacturer. General Electric refrigerators have been ordered for three Portland, Me., apartments. Directors of the New England Telephone & Telegraph Company voted $1,437,704 for plant construction, effective immediately.

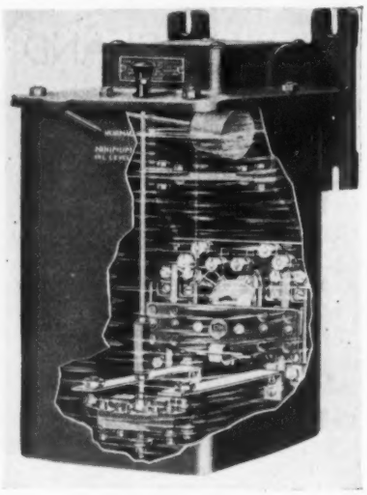
CONSTRUCTION PROJECTS

Bureau of Supplies and Accounts, Navy Department, Washington, D. C., will receive bids until September 22 for cable connectors, reducing sleeves, etc., for Portsmouth, N. H., navy yard (Schedule 6530); also, until September 29, for main motors, ventilating and cooling apparatus, control equipment, etc., for same yard (Schedule 6462). Commonwealth of Massachusetts, Department of Correction, Boston, will build addition to prison at Norfolk, Mass., to cost over $125,000.

New Equipment Available

Oil-Immersed Explosion-Proof Starter

AN EXPLOSION-PROOF, across-the-line automatic starter for a.c. squirrel-cage induction motors has been announced by Cutler-Hammer, Inc., Milwaukee, Wis. Distinguishing this new starter from similar explosion-proof equipment is the immersion in oil of its thermal overload mechanism.



The new starter is designed in keeping with the latest requirements of the Underwriters' Laboratories for class 1, group D, hazardous locations. The contacts of this starter open under a 6-in. head of oil. A special provision is made for bringing all incoming wires to the terminals below the oil level. A float-operated oil indicator shows the oil level. Threaded conduit openings and a compound-filled junction box are included.

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Photo-Electric Lighting Control Relay

TO ENABLE THE INTENSITY of natural light to control artificial lighting automatically, a new photo-electric lighting control relay has been developed by the Westinghouse Electric & Manufacturing Company. When the intensity of daylight decreases to a certain point this device operates to turn on electric lights, and conversely, when the natural light increases to a certain intensity, it causes the lights to be turned off.

The operation of the lighting control relay is effected by variations in the intensity of light falling on a photo-electric tube. These variations produce proportional changes in the amount of current passing through the tube, and this changing current, amplified in a specially designed amplifier tube, energizes a primary relay controlling an auxiliary contactor, which in turn operates the main contactor controlling the lighting installation.

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Interchangeable Shallow Safety Panelboards

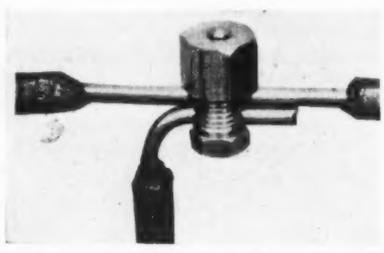
A LINE OF SHALLOW safety panelboards to augment its line of standard safety panels has been announced by the switch and panel division, Square D Company, Detroit, Mich. This involves cabinets 6x19 in. which can be supplied for flush or surface mounting. The flush-mounted cabinets have trims equipped with self-adjusting trim clamps similar to those used on Square D lighting panels.

The panelboards offer several refinements, such as test holes in the door for fuse tests, swivel bladeholders which permit locking the circuit on or off and flush type door locks and latches. Twin units are convertible between 30 and 60 amp., 125 or 250 volts, while the single units are convertible for 30-, 60-, 100-amp fuse clips, 125 or 250 volts. All units are interchangeable.

▼

Cap Type Connector

A NEW CAP TYPE CONNECTOR has been announced by the W. N. Matthews Corporation, St. Louis, Mo., as an addition to its line of solderless service connectors. The new connectors are made for Nos. 10, 6, 4 and 2 size solid wire or as large as No. 3 stranded wire. The nut type connector is used on the four larger sizes, Nos. 1, 00, 000 and 0000, as it is large enough for all purposes.



These connectors do away with soldering and eliminate the possibility of bad connection or the hazard or hot solder and blow torches.

Indoor Lighting Control Relay

AN INDOOR LIGHTING CONTROL relay designated CR7505-D3, designed to meet indoor demand for an equipment to turn artificial lights on and off automatically depending upon the light intensity, has been announced by the General Electric Company. Photo-electric and pliotron tubes are used. The auxiliary equipments are two potentiometers which can be adjusted from the front of the inclosing case, a sensitive relay and a normally open contactor with two insulated, single-pole interlocks. There are also included the necessary transformer, resistors, etc.

The relay can be supplied to operate from 110 or 220 volts at 25 or 60 cycles. The contactor is rated 15 amp. at 110 or 220 volts, a.c. The equipment is designed for operation in temperatures not to exceed 150 deg. F. The relay will draw about 10 watts or less when the contactor is open and approximately 20 watts when it is closed.

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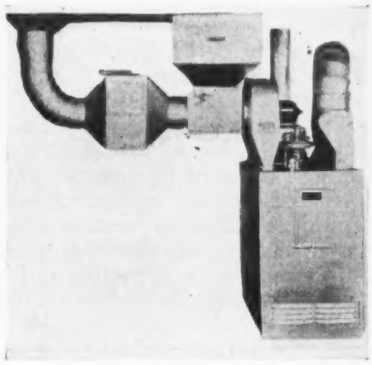
Combined Heating and Cooling Plant

A NEW HOME HEATING and cooling plant, the "Hot-Kold," has been placed on the market by the General Iron



Works Company, Cincinnati, Ohio. The cooling unit is manufactured by Frigidaire Corporation and is the same type that is used in Frigidaire room coolers. The "Hot-Kold" is an automatic gas-fired system of the forced-air type equipped with a Frigidaire evaporator and compressor. Warm air ducts of the system are utilized to circulate the cooled air in summer. The cooling unit is installed in the central return air duct and a by-pass carries the cooled air past the heating unit through a circulating fan, which has a capacity of 600 cu.ft. per minute.

The heating unit is entirely automatic in operation and the cooling equipment can be manually or automatically controlled.